LARGE SCALE SOLAR FARMS: THEIR WORST EFFECT

There are multiple concerns and issues with the types of large scale solar farms being proposed & built in the Midwest. However, ~ this report will focus on the most concerning impact, ~ Agricultural Economy, the loss of Food Production and the risk of a permanent loss of the land.

Economic Impacts (More Like Devastation) to Indiana:

A. The "supposed" economic benefit:

Solar Developers promise economic benefits to Counties in the form of tax revenue with a down payment (aka bribe of instant money). The calculations underlying their assertions are generally NOT publicly disclosed, so it is difficult to determine if the amounts, as stated, would be in fact, correct.

- The change in land use from an active local enterprise to an investment property where profits will be upstreamed to an out-of-state parent company, the Project may result in more of the land being owned by out -of-state residents. If this occurs, the tax revenues based on payments to landowners will not be taxed in the Indiana County, but rather in the domicile district of the landowner.
- While it is true that the installation of solar equipment will result in new assessed value and tax receipts, it is not necessarily true that the expected tax receipts will continue or remain at the same level.
- Solar Developers state that the Project may be sold in whole or in parts to public utilities. If the Project is sold to a governmentally owned utility, the solar equipment is exempt from taxation.
- There are transactions which can act to reduce the assessed value and thus the tax receipts, including, but not limited to, sale/leaseback transactions, multiple sales, perhaps to a related party and back, where the Fair Market Value is reset with each sale, and some financing transactions that may result in reduced values and corresponding reduced tax receipts.

Conclusion: The economic benefits are illusionary & misleading. Without conditions on transactions that could reduce the asserted tax benefit, approval of solar projects on the basis of level, estimated lifetime taxes is not warranted. (Res#1)

B. The "supposed" economic benefit is NOT new money:

Any supposed economic benefit analysis fails to take into consideration what economic benefits the Project will displace.

- The land has already been developed and it is PRIME FARMLAND. What is being lost by taking PRIME FARMLAND out of Agricultural production for 35 years, OR FOREVER???
- Large Scale Solar projects are displacing an existing economic good producing industry, and the payments to landowners are not new, but simply replace the lost benefits from the agricultural activity. Indeed, given that farming has an economic multiplier effect in that it actively spends and supports other businesses, while the Project will be a passive economic business actor, the economic benefit will in fact be less than what is currently being generated.
- First, ~ understand some Indiana Agriculture Facts:
    1. Indiana is 1 of only 3 States with over 50% of its land designated as Prime Farmland, defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and at the highest yields possible. It is the BEST land in our Nation.
    2. A 2015 Financial Report by Indiana University, Kelley School of Business: Beyond The Farm: A State and Regional Report on the Economic Contribution of Farms, Forests, and Related Industries reveals:
        - ✦ Agriculture contributes an estimated $44.2 billion to Indiana's economy, and approximately $13 billion of that amount is the result of ripple effects such as related supply-chain purchases and spending by workers.
        - ✦ Indiana is the eighth largest agricultural leader in the nation, exporting just over $4.6 billion in 2017.
        - ✦ Indiana's agricultural output supports nearly 190,000 Hoosier jobs, and of those jobs, 107,500 are directly involved in agricultural production and processing.
        - ✦ Using the most recent census data available from the U.S. Department of Agriculture, researchers at the Indiana Business Research Center found that agriculture creates $14.9

billion in value added — an amount equal to nearly 5 percent of Indiana's gross domestic product.

- "Keep in mind that Indiana's farmers and agriculture-related manufacturers generated these impressive numbers during a tough year (2012) plagued by severe drought. These impacts would likely be higher in a more typical year," said Matthew Kinghorn, economic analyst at the IBRC.
- Indiana's agricultural output is heavily concentrated in corn and soybean crops, which together account for 63 percent of the state's total agricultural production.
- Representative Soliday, author of HB1381, states Indiana will suffer economically as limiting renewable energy is hindering corporations from coming to Indiana. However, the IU study says, "Therefore, the degree to which agriculture is able to contribute to Indiana's economic growth going forward will be an important economic indicator for the state." Has Soliday forgotten that he lives in one of the most important Agricultural States in our Nation, or is he just not aware that these mostly foreign Solar Companies are wiping out hundreds of thousands of PRIME farmland in the Midwest? (Res#2)

3. For decades, Purdue University and other Agricultural Institutions have advocated for the protection and preservation of our most precious, finite resource ~ farmland, especially that which has the designation of Prime Farmland. Most Comprehensive Plans in Indiana advocate for the protections of prime farmland. Why are Counties ignoring their duty and responsibility to protect the land? American Farmland Trust has taken on the most recent investigation of how much farmland has been lost in our Nation. Their study, Farms Under Threat was released in 2018 and The State of the States was released in 2020. ALL Government Representatives should be concerned: (Res#3,#4,#5)
   - **The U.S. converted almost 31 million acres of agricultural land between 1992 and 2012**. By including woodlands associated with farms and low density residential development, this analysis found nearly twice the conversion previously reported. The loss is equivalent to developing most of Iowa or the entire state of New York.
   - **Overall, development disproportionately occurred on agricultural lands.** More than 70 percent of urban development and 62 percent of all development took place on agricultural land. Expanding urban areas accounted for 59 percent of the loss, including the commercial, industrial, transportation, and high-density residential development which reflect the expanding footprint of U.S. cities and towns. Low- density residential development accounted for 41 percent of the loss and included residential areas with houses built on one- to 20-acre parcels and exurban homes on even larger lots that effectively removed these properties from agricultural uses.
   - **Urban development favored cropland while low-density residential development posed an equal threat to cropland and pastureland.** Urban development most frequently converted cropland (41 percent) and lower percentages of pastureland (25.9 percent), rangeland (23.8 percent), and woodland (9.3 percent). In contrast, low-density residential development posed an equal threat to cropland and pastureland (34.5 percent each) and favored woodland (19.9 percent) over rangeland (11.1 percent). For forestland, low-density residential development presented a greater threat than urban development.
   - **The impact of these development patterns puts high quality agricultural land at risk.** The analysis assigned values to reflect the productivity, versatility, and resiliency (PVR value) of agricultural land for cultivation. As the PVR value increased, fewer acres of land qualified. The analysis found that the median PVR value of agricultural land lost to development was 1.3 times higher than the median PVR value of land that stayed in production. These cumulative and irreversible losses of most productive, versatile, and resilient lands have serious implications for agricultural productivity and domestic food security.
   - **By 2012, the best land to support intensive food and crop production had dropped to less than 17 percent of the total land area in the continental United States.** Only 324.1 million acres of agricultural land had PVR values with the optimal soil characteristics and growing conditions to support intensive food and crop production with minimal environmental limitations. This is slightly more than one third of agricultural land.
   - **In less than one generation, the United States irrevocably developed nearly 11 million acres of its best land for intensive food and crop production.** While a 3.2

percent loss does not sound devastating, it is roughly equivalent to losing one of the most productive growing regions in the United States, California's Central Valley.

C. <u>What are the Economic Impacts from removing farmland from production? DEVASTATING!</u>
Professor Steven Miller, Economist at Michigan State University was consulted and performed an analysis of the Lone Oak Solar Farm being proposed in Madison County, Indiana.

- **<u>Miller's Background</u>**: He is the Assistant Professor in the Department of Agricultural, Food, and Resource Economics at Michigan State University. He is considered an expert in Policy Impact Modeling. He specializes in applied economic methods for forecasting and impact analysis. Professor Miller is also the Director of the Center for Economic Analysis. He has authored numerous documents, articles, and been a part of many projects.
- **<u>About Lone Oak Solar:</u>** Invenergy, the Solar Developer, has proposed a 120MW solar farm in northwestern Madison County, Indiana. Invenergy stated economic benefits in tax revenue of approximately $24 million dollars. The leased acreage is approximately 1,890 acres. The project was approved in 2019, however the local community has filed numerous lawsuits. Currently, the case is headed to the Indiana Court of Appeals.
- **<u>The Results:</u>** These estimates only take into account of expected impacts tied to reduced agricultural activities as currently exercised on these farms:

Impact Type	Employment	Labor Income	Regional Income	Output
Direct Effect	1.8	$163,511	$505,412	$1,038,051
Indirect Effect	2.0	$41,566	$324,011	$665,476
Induced Effect	1.5	$35,756	$301,368	$641,210
Total Effect	5.3	$240,833	$1,130,791	$2,344,737

<u>Hence, we estimate that the direct annual loss of agricultural output and associated economic measures are</u>:

- 1,890 acres taken out of agricultural crop production and placed in PV-electricity production
- $1,038,051 in gross farm revenues (cash sales of farms)
- $363,321 in farm net revenues (Farm revenues to proprietor, farm capital and farm land)
- $75,600 in farm labor earnings (excluding proprietor earnings)

<u>Over 35 years of operation, this represents a decline in (2020 $ values held constant)</u>:

- $36,331,800 in gross farm revenues
- $12,716,200 in farm net revenues
- $2,646,000 in farm labor earnings

<u>Direct loss of agriculture sales of $1,038,051 will create a decrease in total transactions in Madison County, totaling $2.34 million per year. This would result in a reduction of regional income of just over $1.13 million per year. Total labor income will be expected to decline by $240,833 per year, impacting just over five local workers.</u>

<u> The TOTAL EFFECT of $2,344,737 (total annual loss) X 35 YEARS (the life of the project) = $82,065,795 **</u>**

<u>THE MADISON COUNTY, INDIANA, COMMUNITY WILL LOSE OVER $82 MILLION DOLLARS AGAINST INVENERGY'S "SUPPOSED" TAX REVENUE OF $24 MILLION DOLLARS!</u>

D. <u>Even more concerning is the risk of losing the Agricultural Lands FOREVER:</u>
Solar Developers claim that the lease is temporary and that the farmland can easily be returned to agricultural activity at the end of the life of the project (estimated at 30-45 years). In addition, they claim that Solar Farms protect the prime farmland from residential housing developments and continued urban sprawl.

- IF solar/wind are much-needed energy resources, WHY are they temporary and have decommissioning plans to begin with? This is a hypocritical endeavor if we MUST have renewable energy.
- Many decommissioning plans allow for a plan to replace solar panels, make improvements at the end of life of the project, & continue the energy source. If the energy source does continue, then HOW does this protect the Agricultural Lands when it NEVER gets back to agricultural activity? Most Comprehensive Plans in Counties that are heavily dominated in Agricultural Activity call for the protection of farmland. Therefore, Solar Farms DO NOT meet these stated plans when the Solar Developer has misled the Landowner, County, & Community about their future intentions of the project. This is an irresponsible land use change <u>that could be permanent, risking the loss of our prime farmland FOREVER</u>.
- NOT ONE Agronomist and Soil Scientist has provided ANY documentation that supports the Developer's claims that the land can be farmed again and NONE support the placing of large scale solar farms on prime farmland. To date, not one document, study, or article provided by solar developers references ANY Agronomists and Soil Scientists approving of this endeavor. Check the authors & their credentials! Check the Resources for Agricultural Professionals! Who are you getting your proof, education, and advice from?! Professor Ron Heiniger, Agronomist and Soil Scientist from North Carolina University has written several reports and articles advising AGAINST solar development on farmland. He has taken a stand against the Solar Industry's false claims. (See Res#7). The North Carolina Cooperative Extension has also written a document that includes many cautions of solar being placed on farmland. (See Res#8). And ironically, ~ even some educational links provided by the Solar Industry direct the reader to studies from the United Kingdom, where they adamantly protect farmland and prevent solar farms on Agricultural lands. (See Res#9).
- The American Planning Association has stated that Solar Farms should NOT be placed on prime farmland! The APA is a source and guide to ALL Area Planning Commissions across the U.S. Why is the APA being ignored? (See Ref#6)
- Decommissioning Plans being submitted to Counties state that many items will be abandoned beyond 36" in the ground, such as cabling, cement, broken pylons, and more. Even the BLM (Bureau of Land Management) under the Obama Administration called for the FULL decommissioning of Federal Lands placed in Renewables. Does not our prime farmland, the best land in our Nation that is supposed to grow the food for our Country and the World deserve FULL decommissioning as well? This is more irresponsible behavior of the Solar Industry that will DEFINITELY ruin the future use of the land, whether it's agricultural or developed into housing!
- Michigan State University Cooperative Extension recently released a document giving guidelines and cautions to Landowners considering leasing farmland for Solar Development. The document mentioned that many leases now contain Options and First Rights to purchase the land. Again, ~ the very fact that our prime farmland is being threatened with a permanent land use change is REAL and more likely to occur than most understand. More and more foreign companies are building Renewable projects in America. Who will eventually own our land AND our energy sources is the most concerning effect of all! (See Res#10
- "The ownership of 40 percent of America's agricultural land will be in transition within the next 15 years, putting both family farmers and the land they steward at risk. Meanwhile, would-be farmers often can't afford to enter the field. These financial realities are now coming to a head with a demographic tidal wave the likes of which American agriculture has never seen. American Farmland Trust estimates that 371 million acres of farmland and ranchland could be in transition in the next 15 years, due simply to the age of farmland owners. Much of that land could be lost to agricultural production, unless we can find a way to get it into the hands of the next generation of farmers and ranchers. That's a big challenge." ~ direct quote from American Farmland Trust. (Res# 11). Understanding this grave reality makes the future production of food and the need to protect farmland an utmost and urgent priority! We CANNOT lose farmland to solar farms!!

CONCLUSION:

***Solar installations require over ten times more land area than non- renewable sources to generate the same amount of energy, and the requirement of large tracts of land for their construction has become the largest cause of land use change in the United States** (Trainor et al. 2016; Ong et al. 2013). Source of this quote: https://journals.plos.org/plosone/article?id=10.1371/ journal.pone.0162269

CONSIDER AND UNDERSTAND THIS VERY IMPORTANT FACT:

"The United States is blessed with a remarkably productive agricultural landscape. The precious arable land that sustains life on Earth is a finite and irreplaceable resource that is under heavy stress. Less than six percent of the Earth's surface is suitable for agriculture and growing food. Cropland, pastureland, rangeland, and woodland support a regionally diverse food and farming system capable of ensuring domestic food security. Agricultural land contributes to state and local economies, supplies lucrative export markets, and bolsters the nation's balance of trade. It also supports a trillion dollar/year agriculture economy. Farmland is the foundation of our rural communities, providing jobs, recreational opportunities, and a deep connection to the land. These exceptional natural resources sustain valuable wildlife habitat, provide flood control and fire suppression, scenic views, and resources for hunting and fishing. This land also acts as an enormous carbon sink, drawing down carbon from the atmosphere, which helps combat climate change. Without farmland and ranch land, we can't win the global fight against climate change. Our food, our water, our environment, our survival ~ it all depends on American agricultural land. **By 2050, the demands on agriculture to provide sufficient food, fiber, and energy are expected to be 50 to 70 percent higher than they are now. Given a limited land area in the United States and the need to feed and house an increasing number of people, it is more important than ever to protect the agricultural land and natural resources needed for long-term sustainability. No Farms = No Food = No Future."** ~American Farmland Trust, Farms Under Threat

WE HAVE ALREADY BEEN ADVISED BY EXPERTS:

"Solar facilities can be appropriately located in areas where they are difficult to detect, the prior use of the land has been marginal, and there is no designated future use specified (i.e., not in growth areas, not on prime farmland, and not near recreation- or historic areas). A solar facility located by itself in a rural area, close to major transmission lines, not prominently visible from public rights-of-way or adjacent properties, and not located in

growth areas, on prime farmland, or near cultural, historic, or recreational sites may be an acceptable land use with a beneficial impact on the community." ~ American Planning Association, Planning Advisory Memo, Sept/Oct 2019. AGAIN, WHY ARE PLANNING COMMISSIONS & GOVERNMENT OFFICIALS IGNORING THE GUIDANCE OF THE AMERICAN PLANNING ASSOCIATION? (Res#6)

A FUTURE PREDICTION: WILL YOU HEED THE WISE ADVICE OF EXPERTS?

"In Indiana, and throughout the Midwest, life begins and ends with the LAND. In war, generals often speak about what is happening at the "Front." In the Battle of the Bulge, the Front was at Bastogne, a small town in Belgium. But, in the History books, it was a turning point. It stopped the Nazi's advance. For Indiana, the "Front" is the LAND. In Indiana and the Midwest, the LAND is where the citizens – the Farmers and the Landowners - have to make their stand. If the "Front" folds, the future of the people, the communities, the counties and the states will be changed forever. After the solar power plants are erected, they employ almost no one, except perhaps or a night watchman. Farm related jobs and the supporting businesses will disappear and people will have to go on food stamps. That will become our major industry. The United Nations issued a report in 2019 to protect farmlands or face a hungry future. Over time, food supplies will begin to dwindle and world hunger will begin to raise its ugly head. Just look at what has happened when all manufacturing jobs in Michigan and Wisconsin were exported to China and southeast Asia. Look at the misery that caused. How is the upper Midwest referred to today? It's called the "Rust Belt." If that happens to our Farming States in the Midwest, they will be called the "Dirt Belt." And, for what reason? For 20 or 30 years of intermittent solar power? What are we going to do for power then? Go back to coal? And, we'll be left with miles and miles of rusting solar panels covering the once fertile farmland. And the Solar Developers operating as LLCs will be long gone, leaving the Counties too broke to pay for cleaning up the toxic mess that has contaminated our once fertile soil." ~ Dr. Herbert M. Eckerlin, Emeritus Professor of Mechanical & Aerospace Engineering, North Carolina State University, Raleigh, NC.

"Take care of the land and
the land will take care of you . . . ."
—Soil conservation pioneer,~ Hugh Hammond Bennett, 1947

Please vote NO on HB1381 and allow the Counties and Citizens to plan and control Renewable Energy resources. We know our County better and have done A LOT MORE education than the State has!
Suggested Amendments are:
1) PROTECT PRIME FARMLAND
2) DEMAND FULL DECOMMISSIONING

3) NO SOLAR PANELS TO CONTAIN CADMIUM TELLURIDE, LEAD, AND GEN-X/PFAS CHEMICALS
4) DEMAND INDEPENDENT STUDIES OF ECONOMIC AND ENVIRONMENTAL IMPACTS AND PROPERTY VALUE DAMAGES
5) SETBACKS TO 1000' OF RESIDENTIAL PROPERTIES WITH PROPER BUFFER/SCREENING
6) NO RESIDENTIAL PROPERTY SHALL BE AFFECTED ON MORE THAN ONE SIDE
7) A PROPERTY VALUE GUARANTEE TO ANY HOMES AFFECTED, ESPECIALLY THOSE IMPACTED ON 2, 3, AND ALL 4 SIDES BECAUSE RURAL HOMEOWNERS SHOULD NOT HAVE TO LIVE INSIDE INDUSTRIAL POWER PLANTS. LAWSUITS ARE ALREADY IN THE WORKS FOR AN UNFAIR TAKING OF HOME VALUES. ATTORNEYS ARE BEING CONSULTED ABOUT INVERSE CONDEMNATION!
8) ONLY LANDOWNERS WHO HAVE OWNED THE LAND FOR A MINIMUM OF 5 YEARS CAN BE ELIGIBLE TO SIGN SOLAR LEASES. INDIVIDUALS, COMPANIES, & FOREIGN ENTITIES ARE PURCHASING AMERICAN SOIL FOR THE PURPOSE OF BUILDING SOLAR FARMS.
8) JUST ADOPT THE UNITED KINGDOM GUIDELINES IN RESOURCE #9 BELOW. THEY ARE SMARTER THAN WE ARE REGARDING PROPER CITING OF SOLAR DEVELOPMENT, SCREENING AND BUFFERS.

TOTAL INDIANA FARMLAND SOUGHT =
89,016 ACRES & COUNTING

1,890 acres Madison County
1,400 acres Lake County
1,800 acres Shelby County (north)
1,900 acres Shelby County (south)
1,777 acres Clinton County
1,800 acres White County
1,800 acres Sullivan County
4,000 acres Howard County
9,200 acres Pulaski County
5,000 acres Jasper County
1,400 acres Boone County
1,400 acres Randolph County
700 acres Henry County
300 acres Spencer County
1,439 acres Spencer County
1,200 acres Bartholomew County
1,200 acres Knox County
1,200 acres Pike County
1,600 acres Gibson County
3,000 acres Posey County
210 acres St. Joseph County
1,600+ acres DeKalb County
44,800 acres Starke County (70 sq.miles)

*Information above gathered from online sources, news outlets, & concerned citizens.
*Thousands of rural homes are being surrounded on multiple sides forcing homeowners to live inside industrial power plants. There WILL be impacts to values resulting in lawsuits and appeals to accessed values. Home value declines have already occurred from Turbine Projects. Solar will be even more damaging as it covers thousands of acres.
*The above is an incomplete list as more counties are being solicited to lease farmland.

Resources:

Res#1 * Direct quotes concerning the supposed economic benefits gained from Terry Hall, attorney for Concerned Solar Neighbors, Madison County, IN in April of 2019 and made part of the public record via written documentation submitted for legal proceedings.
Res#2 * https://www.ibrc.indiana.edu/studies/BeyondTheFarm.pdf
Res#3 * https://www.extension.purdue.edu/extmedia/AY/AY-245.html
Res#4 * https://s30428.pcdn.co/wp-content/uploads/sites/2/2019/09/Why_Save_Farmland_1-03_1.pdf
Res#5 * https://farmland.org/project/farms-under-threat/ and https://s30428.pcdn.co/wp-content/uploads/sites/2/2019/09/Why_Save_Farmland_1-03_1.pdf
Res#6 * https://www.planning.org/pas/memo/2019/sep/
Res#7 * https://coastalagro.com/solar-farming-not-a-good-use-of-agricultural-land/ and https://www.carolinajournal.com/news-article/big-solar-farms-may-be-stressing-agriculture-ecosystem/ and Professor Ron Heiniger silences an angry and ignorant Solar Developer here: https://www.clintonnc.com/news/agriculture/6192/farming-and-solar-energy
Res#8 * https://craven.ces.ncsu.edu/considerations-for-transferring-agricultural-land-to-solar-panel-energy-production/
Res#9 * https://www.bre.co.uk/filelibrary/nsc/Documents%20Library/NSC%20Publications/NSC-publication-planning-guidance.pdf. This document was provided by a sub-contractor working for the Solar Industry.
Res#10 * https://energizeohio.osu.edu/sites/energizeohio/files/imce/Agricultural%20Solar%20Energy%20Development%20Understanding%20Lease%20Agreements%20for%20Utility-Scale%20Installations.pdf?fbclid=IwAR155Ood7RcKE2TROn8p1RQqyvlOKj531WVPVdmrpvu46EYt9GAKo8OTl5A
Res#11 * https://farmland.org/keeping-farmers-on-the-land-read-more/

This report compiled and written by Denise Spooner, Madison County, IN ~ Licensed Real Estate Broker & Farmer's Daughter

PLEASE LOOK AT THE PHOTOS ON THE FOLLOWING PAGES AND REALIZE:

1) LESS THAN 6% of the Earth's surface is suitable for Agriculture and growing food!

2) The dark green area on the map is what is left to farm and feed our Nation and other countries! THAT'S IT.....THIS IS ALL THAT IS LEFT!

3) Look at the Red areas on the American Farmland Trust maps and understand what has already been lost due to urban sprawl & development.

4) WHY are so many Renewable Energy projects cited in the Bread Basket of America???

5) WILL AMERICANS EVEN OWN THE LAND AND ENERGY SOURCES IN THE FUTURE?

- **By 2012, the best land to support intensive food and crop production comprised less than 17 percent of the total land area.**

Only 324.1 million acres of agricultural land had PVR values > 0.43 that indicated that the right soil characteristics and growing conditions were present and the land could be farmed with the fewest environmental limitations (Figure 6). This is slightly more than one third of agricultural land.

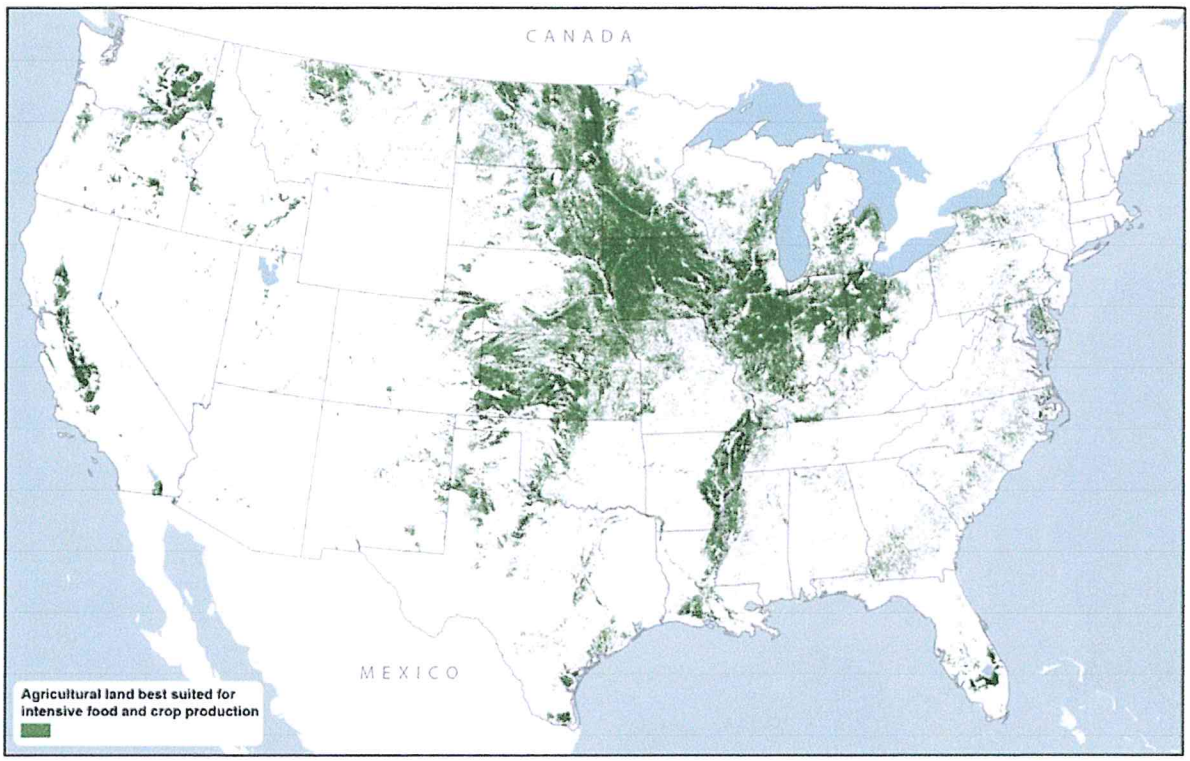
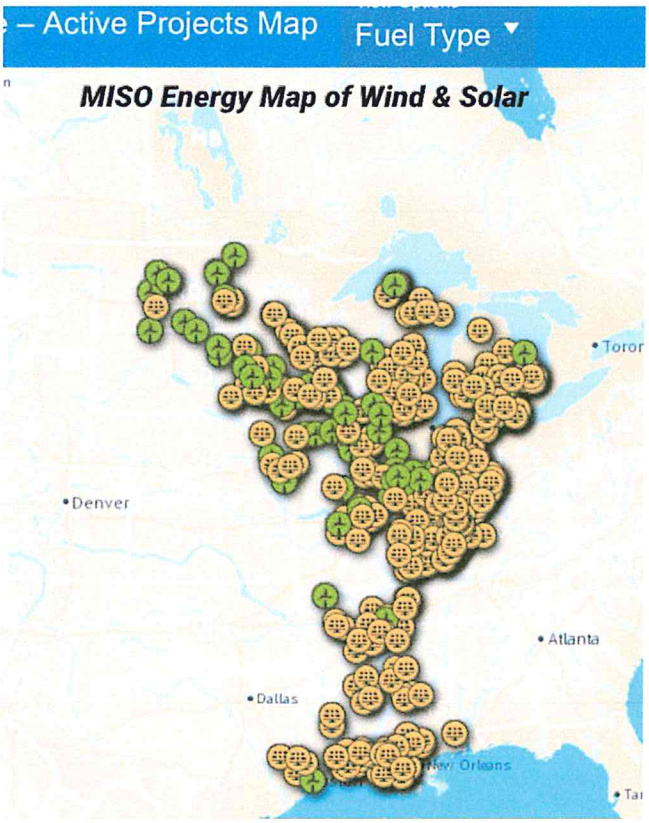
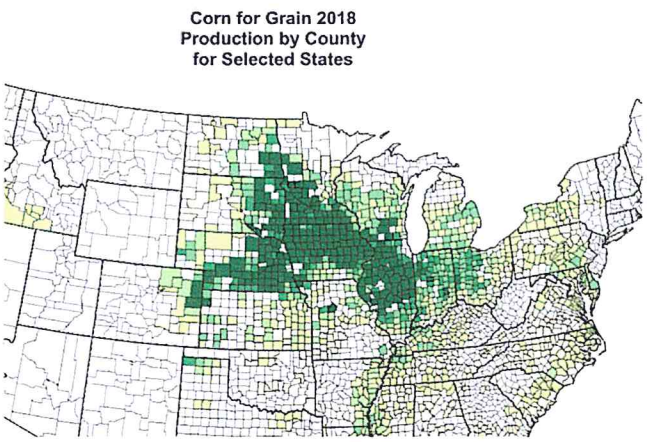
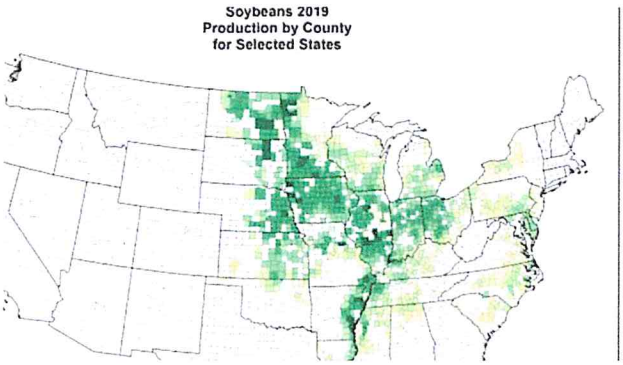


Figure 6: Best agricultural land for intensive food and crop production in 2012.

Agricultural land with PVR values between 0.43 and 1.0 is the land most suited for the intensive production of fruit and nut trees, vegetables, staple foods, grains, and animal feed with the fewest environmental limitations. This land represented about 36 percent of U.S. agricultural land, or only 16.7 percent of the total land area in the continental United States in 2012.







FARMS UNDER THREAT: THE STATE OF AMERICA'S FARMLAND

Farms Under Threat: The State of America's Farmland is a comprehensive spatial analysis of the location, quantity, type, and quality of agricultural land lost to development in the continental United States between 1992 and 2012. It is the first assessment from American Farmland Trust's multi-year initiative examining threats to U.S. farmland and ranchland and evaluating policies and programs to stem the loss.

The Lay of the Land

Agricultural land encompasses about 912 million acres or 47 percent of the total land area in the continental United States. *Farms Under Threat* defines agricultural land as non-federal land that includes a diverse array of land cover/use types: cropland, pastureland, rangeland, and woodland associated with farms. Farmers and ranchers use an additional 158 million acres of federal land for grazing. Agricultural land plus federal land used for grazing comprises 55 percent of the total land area.

THE EXTENT AND DISTRIBUTION OF AGRICULTURAL LAND IN 2012

KEY STATISTICS

Total land area in the continental United States (acres)	1,937,713,000
Agricultural land (acres)	911,666,000
Cropland	313,845,000
Pastureland	108,410,000
Rangeland	409,275,000
Woodland	80,136,000
Agricultural land as proportion of total land area (percent)	47.0
Federal land used for grazing (acres)	158,418,000
Proportion of land used for agriculture (percent)	55.2

American Farmland Trust
www.farmland.org

(800) 370-4879
www.farmlandinfo.org
@farmlandinfo

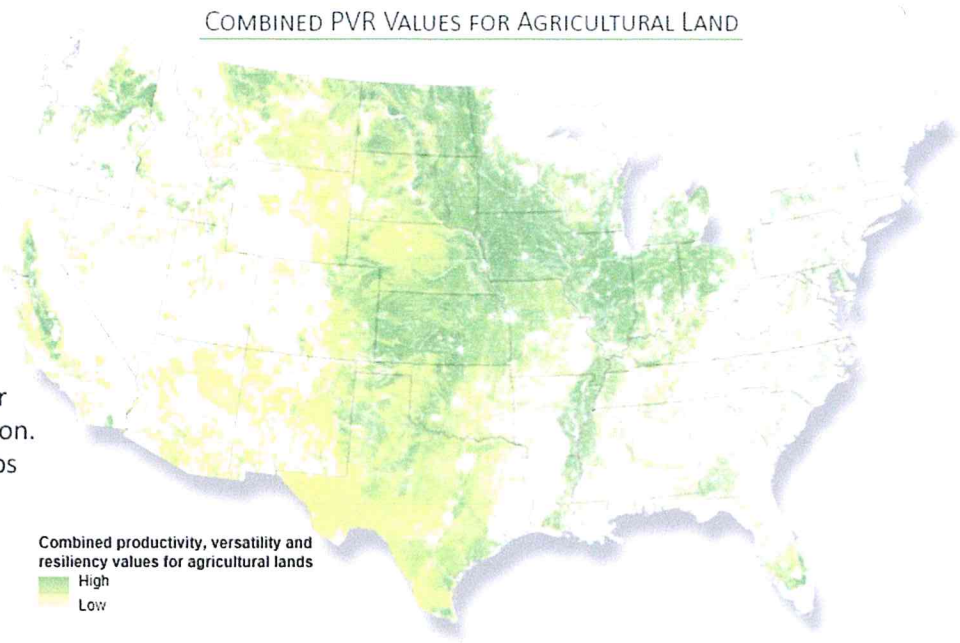
USDA
Natural Resources Conservation Service
www.nrcs.usda.gov

Nationally Significant Agricultural Land

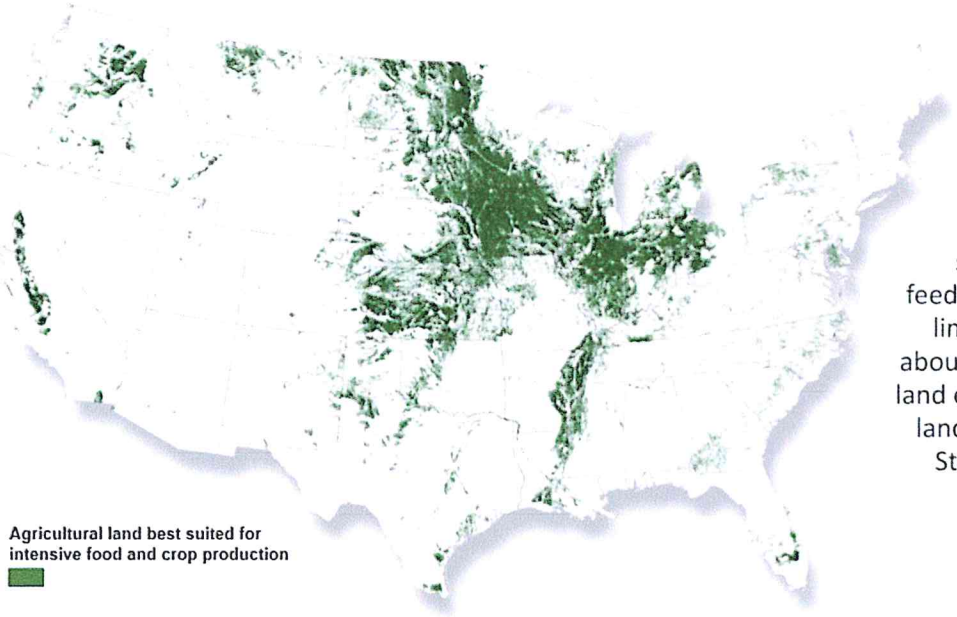
Farms Under Threat classifies agricultural land based on its productivity, versatility, and resiliency (PVR values). We used soil suitability, land cover/use, and food production as factors to assess the land's potential.

Higher PVR values are shown in darker green; lower values in pale green. Lower PVR values indicate land with relatively greater limitations and narrower choices for agricultural production. Farmers may need to adapt crops and practices and increase their level of management to use this land for cultivation.

COMBINED PVR VALUES FOR AGRICULTURAL LAND



BEST AGRICULTURAL LAND FOR INTENSIVE FOOD AND CROP PRODUCTION IN 2012



Agricultural land with PVR values between 0.43 and 1.0 is the land best suited for intensive production of fruit and nut trees, vegetables, staple foods, grains, and animal feed with the fewest environmental limitations. This land represented about 36 percent of U.S. agricultural land or about 17 percent of the total land area in the continental United States in 2012.

KEY STATISTICS

Agricultural land best suited for intensive food and crop production in 2012 (acres)	324,103,000
Agricultural land best suited for intensive food and crop production in 1992 (acres)	335,032,000
Land area in the continental United States that qualifies as best land for intensive food and crop production in 2012 (percent)	16.7
Agricultural land classified as best land for intensive food and crop production in 2012 (percent)	35.6

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USDA
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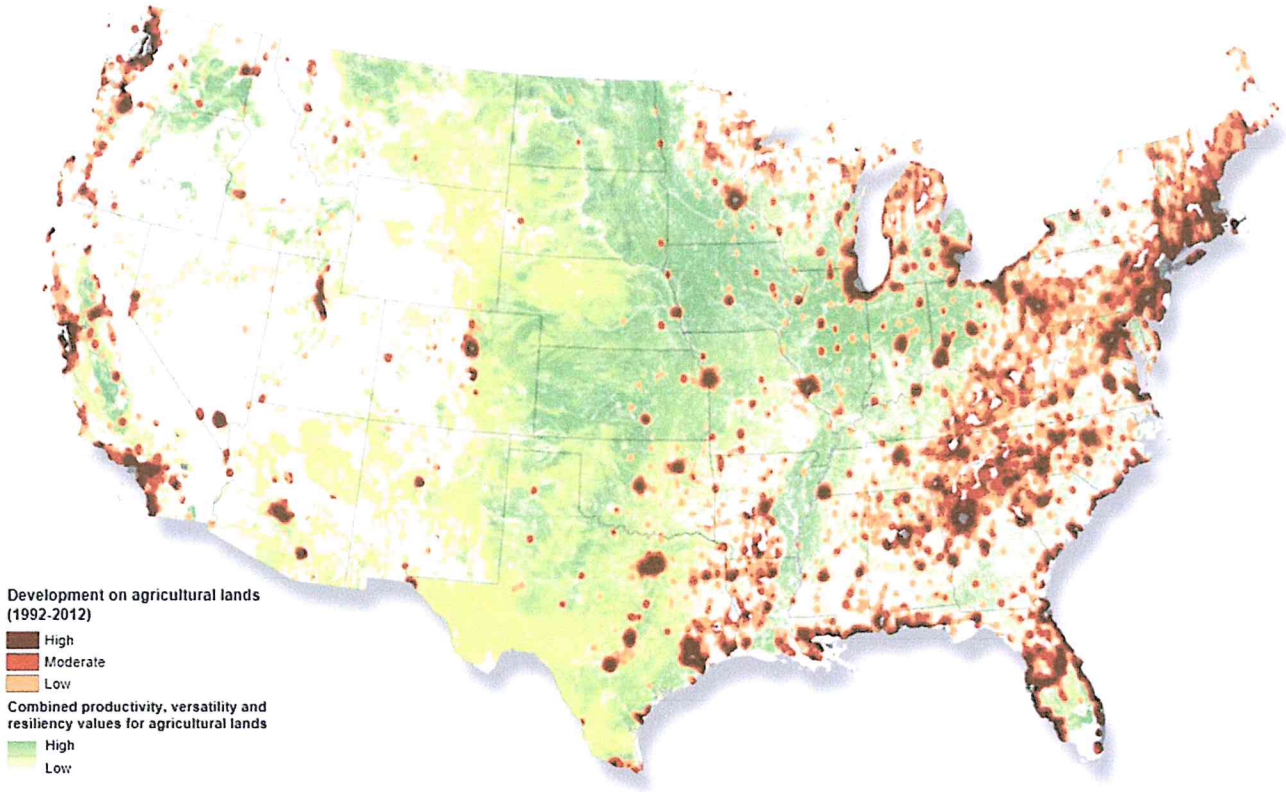
Agricultural Land Lost to Development

Between 1992 and 2012, the United States converted about 31 million acres of agricultural land to development—nearly double the amount previously reported. This is equivalent to all of the agricultural land in Iowa and roughly the size of the state of New York. Development disproportionately occurred on agricultural land—62 percent of development occurred on agricultural land even though agricultural land only accounted for 49 percent of the total land area in 1992. Lastly, during the same time period, the United States lost nearly 11 million acres of its best land.

Development is shown in dark brown (High, 25% conversion of agricultural land in a 10-kilometer radius), red (Moderate, 10–25% conversion), and orange (Low, 5–10% conversion).

CONVERSION OF AGRICULTURAL LAND TO DEVELOPMENT BETWEEN 1992 AND 2012



KEY STATISTICS

Agricultural land converted to development between 1992 and 2012 (acres)	30,727,000
Acres converted by urban development	18,029,000
Acres converted by low-density residential development	12,698,000
Average rates of conversion to development	1.5 million acres/year 175 acres /hour 2.9 acres/minute
Proportion of development on agricultural land (percent)	62.3
Percentage of urban development on agricultural land (percent)	70.4
Percentage of low-density residential development on agricultural land (percent)	53.5
Nationally significant agricultural land developed between 1992 and 2012 (acres)	10,928,000
Median PVR value of agricultural land lost to development	0.39
Median PVR value of agricultural land that stayed in production	0.31

DEVELOPMENT BY LAND COVER/USE (THOUSANDS OF ACRES)

Land cover/use		Urban Development			Low-Density Residential			Total Developed		
	% of ag land	Acres lost	% by land type	% of ag land type converted	Acres lost	% by land type	% of ag land type converted	Acres lost	% by land type	% of ag land type converted
Cropland	34.3%	7,408	28.9%	41%	4,385	18.5%	34.5%	11,793	23.9%	38.4%
Pastureland	11.9%	4,662	18.2%	25.9%	4,379	18.5%	34.5%	9,041	18.3%	29.4%
Rangeland	44.9%	4,285	16.7%	23.8%	1,408	5.9%	11.1%	5,693	11.5%	18.5%
Woodland	8.8%	1,674	6.5%	9.3%	2,527	10.6%	19.9%	4,201	8.5%	13.7%
Total on ag land		18,029	70.4%		12,698	53.5%		30,727	62.3%	
Forestland		5,107	19.9%		9,739	41%		14,846	30.1%	
Other		2,463	9.6%		1,297	5.5%		3,761	7.6%	
Total		25,600			23,735			49,335		

About the Project

Farms Under Threat: The State of America's Farmland is the first report from a multi-year initiative to evaluate threats to agricultural land and the policies and programs that address them. This analysis advances our understanding of the nation's agricultural land base by:

1. Estimating woodland associated with farm enterprises
2. Mapping grazing on federal land
3. Assigning values to agricultural land based on its productivity, versatility, and resiliency, and identifying a subset of nationally significant land best suited to intensive food and crop production
4. Showing spatial patterns of agricultural land use and conversion to development
5. Mapping the pattern and extent of low-density residential development

American Farmland Trust partnered with Conservation Science Partners (CSP), a nonprofit scientific collective, to ensure the spatial analyses are grounded in reliable data and strong science. A national Advisory Committee provided additional guidance.

Farms Under Threat combines county-level estimates of land cover/use from the USDA Natural Resources Conservation Service (NRCS) National Resources Inventory (NRI) and the spatially explicit National Land Cover Database (NLCD). Additional datasets include:

- National Agricultural Statistics Service (NASS) Cropland Data Layer
- NASS Census of Agriculture farm size
- NRCS Soil Survey Geographic Database
- U.S. Census housing density
- U.S. Geological Survey Protected Areas Database

For a complete list of datasets, see the technical report: https://www.farmlandinfo.org/farms-under-threat-technical-report

Farms Under Threat: The State of America's Farmland is supported by the USDA Natural Resources Conservation Service (NRCS) and the members of American Farmland Trust. For more information about the initiative, visit AFT's website: https://www.farmland.org/initiatives/farms-under-threat.

The Farmland Information Center (FIC) is a clearinghouse for information about farmland protection and stewardship. The FIC is a public/private partnership between USDA NRCS and American Farmland Trust.

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Area of Expertise:
Policy Impact Modeling

Degree:
Ph.D, Oklahoma State University
B.A., Oklahoma State University

Fixed-term assistant professor Dr. Steven R. Miller specializes in applied economic methods for forecasting and impact analysis. Dr. Miller is also the Director of the Center for Economic Analysis. As a graduate, Steven maintained and programmed the Oklahoma State University Econometric Forecasting model and served as investigator on several Oklahoma Department of Human Resources studies of TANF funding, and child support studies for impact and needs assessments. He has produced numerous impact assessments of Wichita, Kansas area businesses seeking state and local sponsored incentives, produced papers on aviation demand across competing regional airports, and papers on alternative estimation methods of systems modeling. He is currently working on: Development of Profitable Michigan-Based Meat and Livestock Value Chains.

Research and Outreach Interests

- Building models for and producing national, state and local economic forecasts
- Impact assessment of industry and policy
- State and local incentives for economic development
- Spatial estimation models
- Bayesian vector autoregression models for forecasting
- Impact assessment of recreation destination

Center for Economic Analysis draws on expertise of the faculty that makes up the Department of Agricultural, Food, and Resource Economics, and the center's objectives include linking research questions to appropriate faculty. The center works with department faculty to push through stakeholder requests for economic analysis & has been successful in pushing projects along a wide swath of topics including public policy, health care, agriculture policy, environmental policy and economic development. Steven's personal area of interest is in projects and programs around economic growth and development, including community- and regional-based entrepreneurship programs.

Authored Documents & Articles:

- Analysis of Healthy Food Incentive Programs' Impact on Farmers Market Vendors in Michigan, December 4, 2017
- Economics of Healthy Food Incentives at Michigan Farmers Markets: Study Highlights, August 8, 2017
- Opportunities and Barriers to Growing Michigan's Local Food System: The Case of Meat Processing, August 8, 2017
- Regulatory Routes to Purchasing Michigan Meat, July 13, 2017
- Developing Michigan Meat Processing, Part 1: Processing and Regulation, June 29, 2017
- Michigan Meat Processing Capacity Assessment Final Report, September 26, 2016
- Trey Malone: Travels of the Pilsner in the Michigan Economy, March 28, 2019

Projects:

- Development and Optimization of Solid-Set Canopy Delivery Systems For Resource-Efficient, Ecological
- Effect of Cover Crops on Nitrous Oxide Emissions, Nitrogen Availability and Carbon Accumulation in O
- IR-4 Field Research [2014]
- Minor Crop Pest Management Program - Interregional Research Project No. 4
- Translational Genomics in Cucumber-Tool Development & App. for Recessive Disease Resistance A
- Trunk Injection: A Discriminating Delivery System for Tree Fruit IPM [2013 - 2015]

Articles Featuring:

- Del Monte's Quest to Change How Americans Feel About Canned Produce, February 10, 2020
- What's craft beer worth to the state of Michigan?, May 15, 2019
- What's on tap? Michigan's economy, May 7, 2019
- Trey Malone: Travels of the Pilsner in the Michigan Economy, March 28, 2019
- Craft Beer as a Means of Economic Development: An Economic Impact Analysis of the Michigan Value Chain, February 26, 2019
- Economic Forecast Provides Critical Information for Michigan Stakeholders , December 21, 2018

Lone Oak Solar Installation Estimated Economic Impacts of Reduced Agricultural Production

The Lone Oak Solar project is for the installation of solar photovoltaic (PV) electric generating facility in Northwestern Madison County, IN, encompassing the townships of Monroe and Pipe Creek. This is a 120-megawatt (MW) PV deployment on approximately 850 acres of least lands. Up to 13 disjointed installation sites in proximity will be used spanning a total of 1,890 acres.

This brief economics assessment is a partial analysis, limited to measuring only the value of subverted agricultural production following the installation and operation of the Lone Oak Solar project. As such, this analysis is not to be taken as an economic impact assessment of the Lone Oak Solar project but rather that of the loss of existing agricultural uses of the 1,890 acres of leased lands that will be diverted to PV operations. We assert that the PV panels have a life of 35 years, which is consistent with the expected life of commercial panel installations that range from 30 to35 years. At the end of the project's life, the panels will be partially or fully replaced with the most up-to-date PV systems, or the PV fixtures will be removed with cost. Who bears that cost of transitioning back to agricultural uses depends on the nature of the land-lease agreements. In this study, such end-of-life expected costs are not included in the analysis.[1]

We used typical crop rotations for Madison County and commodity expenditure and revenue profiles developed at Purdue to estimate the economic direct effects of forgone agricultural production. Accordingly, the crop rotation modeled was corn-corn-soy beans, indicating that corn is grown on two out of three years, while soybeans are grown one of every three years. This rotation and associated crop production budgets were selected to be representative of the crop production activities currently practiced on crop-producing acreage to be diverted. Other major crops also appear on the USDA CropScape tool for Madison County, including winter wheat, wheat/soy bean double crop, alfalfa/hay and tomatoes, though their absolute numbers, in terms of acres planted, sum to less than 10 percent of production agricultural land in Madison County.[2]

Hence, we estimate that the direct annual loss of agricultural output and associated economic measures are: [3]

- **1,890 acres taken out of agricultural crop production and placed in PV-electricity production**
- **$1,038,051 in gross farm revenues (cash sales of farms)**
- **$363,321 in farm net revenues (Farm revenues to proprietor, farm capital and farm land)**
- **$75,600 in farm labor earnings (excluding proprietor earnings)**

Over 35 years of operation, this represents a decline in (2020 $ values held constant):

- **$36,331,800 in gross farm revenues**
- **$12,716,200 in farm net revenues**
- **$2,646,000 in farm labor earnings**

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[1] See Heiniger, R.W. 2017. *Cost of Reclaiming Land Currently Used for Solar Panels Back to Farmland.* Department of Crop and Soil Science, North Carolina State University. Plymouth, NC.

[2] See https://www.nass.usda.gov/Research_and_Science/Cropland/sarsfaqs2.php

[3] Estimates provided by the Center for Economic Analysis at Michigan State University under the directorship of Steven R. Miller. For more information contact Steven Miller at 517.355.2153 or by email at mill1707@msu.edu.

Lone Oak Solar Installation Estimated Economic Impacts of Reduced Agricultural Production

We simulated how the loss in annual farm sales translates to economy-wide impacts on Madison County, IN. Economy-wide impacts are larger than direct impacts because dollars recirculate throughout the economy. For example, the sales revenues earned by the grower are partially re-spent in the local economy to purchase seed inputs to the next year's harvest, to purchase fuel, maintain or expand capital like tractors and enclosures, etc. Those receiving payments from the farmers will also re-spend a share to restock on inventories, pay labor, taxes and operating expenses. Households increase their expenditures from labor and proprietary income, creating a second channel of impacts. Together, the business to business transactions and household to business transactions that occur locally make up what we call secondary expenditures (indirect and induced effects, respectively). The cycle continues, decreased only to the extent that purchases are made to suppliers from outside of Madison County. The table below shows estimates using annual estimated economy-wide decreases associated with decreased agricultural activities described above.

Impact Type	Employment	Labor Income	Regional Income	Output
Direct Effect	1.8	$163,511	$505,412	$1,038,051
Indirect Effect	2.0	$41,566	$324,011	$665,476
Induced Effect	1.5	$35,756	$301,368	$641,210
Total Effect	5.3	$240,833	$1,130,791	$2,344,737

Model simulation: Lost Farm Sales Impacts on Madison County, IN

Direct loss of agriculture sales of $1,038,051 will create a decrease in total transactions in Madison County, totaling $2.34 million per year. This would result in a reduction of regional income of just over $1.13 million per year.[4] Total labor income will be expected to decline by $240,833 per year, impacting just over five local workers.[5]

These estimates only take into account of expected impacts tied to reduced agricultural activities as currently exercised on these farms and do not take into consideration employment by Lone Oak Solar in maintaining and operating the solar panel installation. It also does not take into consideration the expected impacts of any annual payments made on behalf of Lone Oak Solar for personal property taxes, income taxes and land lease payments. Finally, the estimates do not take into account any substituted economic activity that may be applied to these lands in the presence of the solar panel installation.

[4] Regional income is the combined labor income, proprietor's income, payments to capital and landowners and indirect business taxes.

[5] Employment may include self-employed proprietors.

labor Costs	10%							
acres	1890	Per acre	Corn		Soy		Corn	Three-yr	
Buffer	0%	Prices		$3.40		$8.35	$3.40		
	1890	Yields		176		54	176		
		Gross Revenues		$598		$451	$598	$549	
		Variable Costs		$418		$235	$418	$357	
		Labor Costs		$45		$30	$45	$40	
		Gross variable Costs		$463		$265	$463	$397	
		Per acres contrib. to margins		$135		$186	$135	$152	
		Sales		$1,130,976		$852,201	$1,130,976	$1,038,100	$1,038,051
		Net Rev		$340,956		$408,051	$340,956	$363,300	$363,321
		Labor Pay		$85,050		$56,700	$85,050	$75,600	$75,600
		Proprietor Income plus capital		**$255,906**		**$351,351**	**$255,906**	$287,700	$287,721
		Life (yrs)		35					
		Gross revenues		$36,331,800					
		Lost farm revenue		$12,716,200					
		Lost labor pay		$2,646,000					

Model simulation

Impact Type	Employment	Labor Income	Regional Income	Output
Direct Effect	1.8	$163,511	$505,412	$1,038,051
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