Wind Power May Stir Up

Greener Crops

Ames Laboratory scientists investigate interaction of wind turbines and crops

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WIND TURBINES IN IOWA'S FARM FIELDS may be doing more than churning out electricity. As turbine blades turn to create "green" energy, they might also be helping green up surrounding crops. Scientists at Ames Laboratory are examining interactions between wind turbines and nearby plants to determine how wind farming might benefit corn and soybean farming.

The team, led by Ames Laboratory associate and agricultural meteorology expert Gene Takle, will focus on the extra air turbulence created by turbines. Takle and his colleagues suspect the turbulence may speed up natural exchange processes between crop plants and the lower atmosphere.

For instance, crops warm up when the sun shines on them, and some of that heat is given off to the atmosphere. Extra air turbulence likely speeds up this heat exchange, so crops stay slightly cooler during hot days. On cold nights, turbulence stirs the lower atmosphere and keeps the nighttime temperatures around the crops warmer.

"In this case, we anticipate turbines' effects are good in the spring and fall because they would keep the crop a little warmer and prevent a frost," says Takle, who is also an Iowa State University professor of agronomy and of geological and atmospheric sciences. "Wind turbines could possibly ward off early fall frosts and extend the growing season."

The research team also plans to examine turbines' effects on moisture levels. Extra turbulence may help dry the dew on plants earlier in the morning, minimizing the amount of time fungi and toxins can grow on plant leaves. And drier crops at harvest help farmers avoid the cost of artificially drying corn or soybeans.

Plus, extra air turbulence could direct more carbon dioxide, a "fuel" for crops, down into the plant canopy or pump carbon dioxide up out of the soil, both of which are potentially helpful to photosynthesis.

Takle's wind turbine predictions are based on years of research on agricultural shelter belts, or rows of trees in a field, designed to slow the wind.

"In a simplistic sense, a wind turbine is nothing more than a tall tree with a well-pruned stem. For a starting point for this research, we adapted a computational fluid model that we use to understand trees," says Takle. "But we plan to develop a new model specific to wind turbines as we gather more data."

The team has started some initial measurements, including making visual observations of wind turbulence upwind and downwind of turbines and placing anemometers to determine turbulence intensity. But the bulk of the wind turbulence measurements and crop moisture, temperature and carbon dioxide measurements will begin in the spring.

"We anticipate the impact of wind turbines to be subtle, but in certain years and under certain circumstances the effects could be significant," says Takle. "When you think about a summer with a string of 105-degree days, extra wind turbulence from wind turbines might be helpful. If turbines can bring the temperature down below 100 degrees that could be a big help for crops."

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