

## Sudangrass

(location: #3 on map) Sudangrass is an annual grass that is native to Africa. Its high growth rates have made it a popular forage crop in America, and it is widely grown for that purpose. Yields up to 18 tons per acre have been reported, although typical yields in Pennsylvania are expected to be lower.

## Sorghum-Sudangrass

(location: #3 on map) Sudangrass can be cross bred with sorghum to create an excellent annual grass that can be used for producing biomass as an energy crop. The grass can be harvested and used either as a combustion fuel or as a feedstock for cellulosic ethanol production.

## Sunflower

(location: #3 on map) Sunflower is a common and distinctive crop in America – it is well known for its large and attractive flower heads that turn to face the sun throughout the day. It is a fast growing crop that can be double-cropped in most parts of Pennsylvania. There are many uses for sunflowers (depending on the variety), including animal feed, oil production, and decorative floral purposes. Sunflower's main potential for bioenergy includes the use of the oil as a feedstock for biodiesel production.

## Switchgrass

(location: #2 on map) Switchgrass is a fast growing perennial grass that is native to the United States. It grows from June to September and can reach a height of as much as 6 feet. Yield from switchgrass in Pennsylvania is as high as 5 tons per acre, although the plant grows surprisingly well on marginal soil as well. Take a look at the field here – can you see the grass? Probably not. This stand was planted one year ago, and is still dominated by other species. The plant is sown from seed, and requires 3 to 5 years to establish itself. Once established, however, lasts for upwards of 20 years and effectively out-competes weeds and other plants. Penn State has been working with switchgrass for many years, and maintains research plots that date back to the 1980s.

## Atlantic Coastal Panic Grass

(location: #1 on map) Atlantic Coastal Panic Grass is a warm season grass that is very similar to switchgrass. The blue-green leaves reach a height of 3-6 feet, and the plant tolerates both sandy soil and mild saline conditions. It has excellent drought resistance. Coastal Panic Grass is native to the US, and can be found from Florida to Massachusetts, and as far west as Texas. This stand is only one year old, and the grass is hard to see amidst the weeds and other plants – herbicides can be used to reduce weed pressure, but the closeness of this field to a drinking-water well makes it inappropriate to use chemical sprays.

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Penn State is an Equal Opportunity University.

For further information on the university's bioenergy program, see the following websites:



<http://www.bioenergy.psu.edu>  
<http://energy.extension.psu.edu>



Penn State

## Energy Crops Field Display 2009



# Welcome!

This year's bioenergy crops display is a field-scale demonstration of several new and proven bioenergy crops for Pennsylvania. Whether you are a farmer interested in branching into the bioenergy market, or merely curious about the topic, we welcome you to have a look around and learn about the exciting potential that bioenergy holds for our state. These crops are not merely display samples, they are being grown at a commercial scale to test their productivity and growth characteristics for use by Penn State and others. We ask that you be safe and remain out of the fields themselves, but you are welcome to walk along the margin of the fields and enjoy the sights.

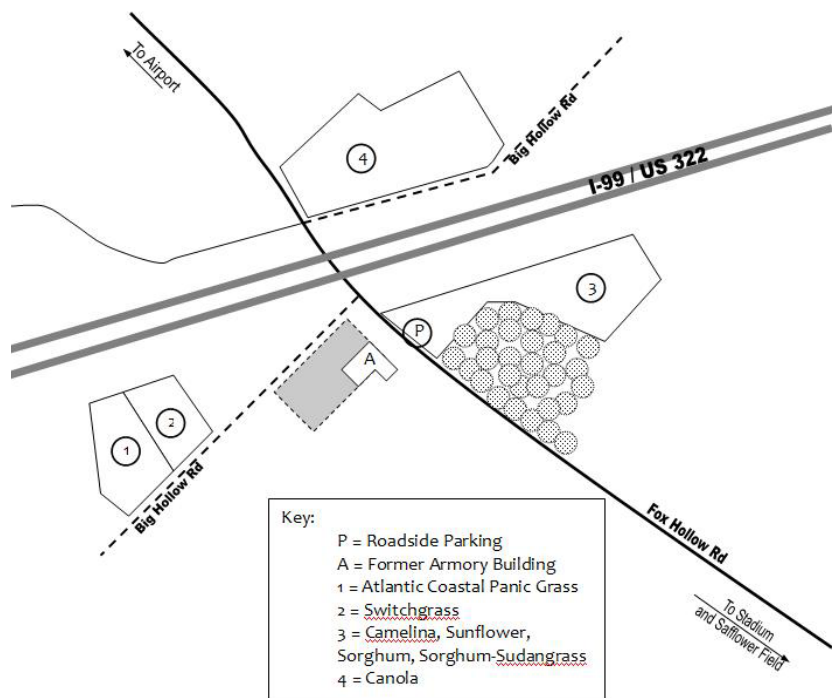
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## Map

Crops for this year's display trials are at two locations. 1) a field of safflower is growing at the Farm Services office, across Fox Hollow Rd from the Ag Arena, and 2) several additional crops are being grown in fields near the former armory building, 1 kilometer north from the Farm Services office (and the Ag Arena) along Fox Hollow Rd. A map of the second site is shown below.



## Crop Descriptions

### Safflower

(location: across Fox Hollow Rd from Ag Arena) Safflower is one of the oldest plants in cultivation, with records of its use dating back to ancient Egypt. The crop resembles a weedy thistle, is remarkably spiny, and is very unpleasant to walk into or handle. However, mechanical harvesting is generally trouble free, and the high quality oil from the plant has beneficial properties for human consumption as well as for the production of biodiesel fuel. The attractive red or orange blossoms that appear in mid summer are sometimes harvested and used to produce dye.

### Camelina

(location: #3 on map) Camelina is an early summer annual short season crop that matures in 85 to 100 days. It is a native of Europe and is also known as false flax or Siberian oilseed. The plants grow 12-36 inches tall and have branched stems with leaves that are arrowshaped and 2-4 inches long with smooth edges. The crop performs well under droughty conditions that can limit the yield of other crops. Camelina seed oil is relatively high in omega-3 fatty acids and low in saturated fatty acids. The meal of canola contains some glucinalates, which cause its use to be limited to some specific feed applications, however it has potential to be used as a poultry feed and produce high omega-3 eggs and poultry meat.

### Canola

(location: #4 on map) Canola is a popular spring or winter crop for cooking oil in America. It is a *brassica*, which means it is related to broccoli and cauliflower. Winter canola is planted in September and harvested in July while spring canola is planted in April and harvested in August. In North America, canola is grown mostly in the Canadian Prairie provinces and in North Dakota, however it does grow well in Pennsylvania. Canola produces an oilseed with an oil content of approximately 40%, about twice that of soybean. The oil has a lower cloud point than soybean, which makes a better biodiesel for use during colder months. Unlike soybean canola requires the use of 80-100 pounds of N per acre which adds to the production cost.

### Flax

(location: #3 on map) The flax plant is best known as the source for linen fibers, which are used to make highly prized fabrics as well as paper and other products. However, some varieties of the flax plant are grown to yield Linseed oil, which can be used for the production of biodiesel fuel. Penn State is examining the potential for using flax as a feedstock for its biodiesel program.

### Sorghum

(location: #3 on map) Sorghum is a tall grass that closely resembles corn in the field. However, it does not develop "ears" like corn. Instead, grain grows on panicles at the top of the plant. Three main types of sorghum are grown: grain sorghum/milo (grown for grain yield), sweet sorghum (grown for syrup extracted from the stalk juice, and forage sorghum. Sorghum is drought tolerant and is one of the top grain crops in the world. It grows in a variety of conditions, but needs hot weather. Sorghum's bioenergy potential includes converting the sweet stalk juice to ethanol or using the biomass as a fuel for combustion or conversion to cellulosic ethanol.