WILLOWPEDIA

Cornell University
College of Agriculture and Life Sciences

FACT SHEET

Breeding and Commercialization of Shrub Willow Bioenergy Crops

Planting willow whips at Loomis field

Regrowth after coppice

Willow cutting header on a New Holland forage harvester

Shrub willow is a sustainable bioenergy crop

Agriculture can contribute to our national goals of achieving energy security and reducing the production of greenhouse gases by growing sustainable bioenergy crops on marginal and underutilized farm land. Shrub willow is one of the new perennial crops that can be harvested on a three-year cycle to provide wood chips as a source of heat, energy, bioproducts and biofuels. Shrub willow energy crops provide numerous environmental benefits, primarily because they are perennial plants that vigorously resprout after every harvest and require minimal inputs of fertilizer and pesticides. Shrub willows grow well on marginal agricultural land in the Northeast and upper Midwest, and could potentially return over 1 million acres of underutilized farmland in New York to productive cultivation, creating jobs and stimulating our economy.

Why grow shrub willow?

Shrub willows grow fast, always produce a large number of small stems, require low inputs of fertilizer or pesticides, and vigorously resprout after every harvest for more than 20 years. Dormant unrooted cuttings are planted mechanically in the spring and the first harvest occurs 3-4 years later. Weed control is critical during the first two years of growth, but after closing canopy, there is little additional maintenance required. Shrub willow can grow productively on marginal, poorly drained sites that are not suitable for food or feed crops.

Shrub willow is harvested in late fall or winter

Shrub willow is best harvested during the winter months while the plants are dormant and the ground is frozen. Case New Holland and Claas have developed cutting headers specifically designed to harvest and chip willow stems with a forage harvester. The chips can be blown into a trailer for transport to market. Average yields range from 4-5 dry tons per acre per year depending upon soil and environmental conditions.

Breeding shrub willow for improved yield

Controlled pollination of willow flowers

As an emerging bioenergy crop that has only a very short history of agricultural cultivation, there is tremendous potential to generate new varieties of shrub willow (species of *Salix*) with improved yield, pest and disease resistance, and water and nutrient use efficiency through conventional breeding. The NYS Agricultural Experiment Station in Geneva is the focal point for willow breeding in North America. Cornell University researchers annually perform controlled pollinations involving elite parental lines chosen from a collection of over 500 willow accessions. Varieties with as high as 40% greater yield have been identified in replicated selection trials and are being tested in yield trials across a wide range of sites.

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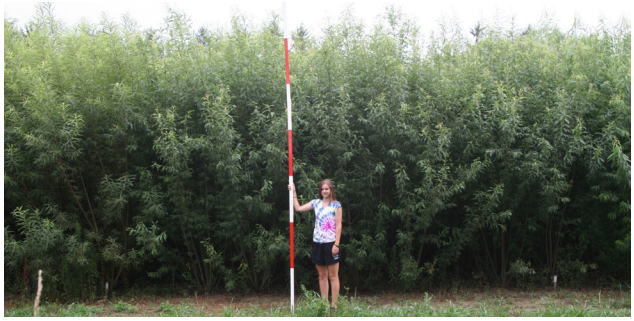

Second year post-coppice growth of shrub willow crops at Big Flats

Commercialization of shrub willow crops

Over 16 elite varieties of shrub willow are now available commercially through Double A Willow nursery (www.doubleawillow.com) and more are in pre-commercial testing and scale-up. Harvested willow chips can be sold to any facility using hardwood chips, including power plants and combined heat and power (CHP) plants. In the future, willow will be used to make biofuels and bioproducts such as biodegradable plastics. Willow is also a suitable feedstock for the production of wood pellets or briquettes for home and industrial heating.

Commercially available willow varieties

Diversity Group	Species	Variety
1	*Salix viminalis* hybrid	SV1
2	*S. sachalinensis*	SX61
3	*S. caprea* hybrid	S365
4	*S. eriocephala*	S25
5	*S. miyabeana*	SX64
		SX67
6	*S. purpurea*	Fish Creek
		Onondaga
		Allegany
7	*S. sachalinensis* x *S. miyabeana*	Sherburne
		Canastota
8	*S. viminalis* x *S. miyabeana*	Tully Champion
		Fabius
		Owasco
		Otisco
9	*S. purpurea* x *S. miyabeana*	Oneida
		Millbrook

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