SS AGR 318

UF UNIVERSITY of FLORIDA
IFAS Extension

Production of Giant Reedgrass for Biofuel[1]

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Introduction

Giant reedgrass (*Arundo donax*) – although considered in some states and by some scientists to be a noxious or invasive weed -- is currently being evaluated as a potential biomass energy crop.

While this publication will discuss the adaptation and production of *Arundo* as a potential energy crop and will also present measures for controlling *Arundo* as an escaped weed, the publication is for information purposes only. The University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) does not have sufficient information at this time to determine the value of *Arundo* as a biomass energy crop or its management overall. Information presented here is taken largely from the publications cited at the end of this document and from initial observations in preliminary university trials.

Current Potential for Use as Biofuel

Arundo, a tall-growing perennial grass species, is found throughout the southern two-thirds of the United States and is prevalent in wetter areas of Florida, particularly in South Florida.

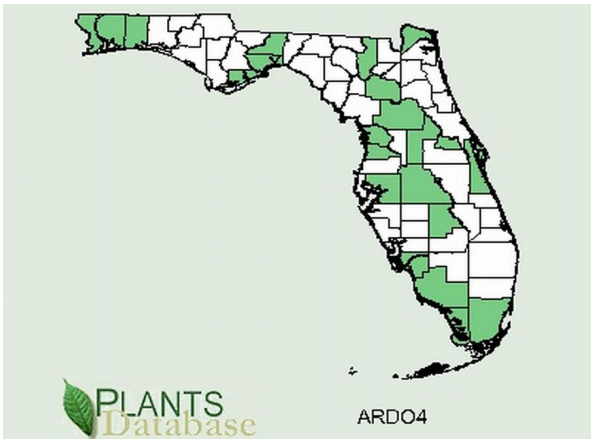

Figure 1. Occurrence of *Arundo* spp. in Florida
Credits: U.S. Dept. of Agriculture, Natural Resources Conservation Service

Arundo donax has potential as a bioenergy feedstock for several conversion processes. Dried *Arundo* has an estimated direct combustion High Heating Value (HHV) of approximately 8000 BTUs/lb. Drying such large amounts of biomass may be difficult, however, thus lower actual energy values in power plants will be realized. *Arundo* is also being considered as a candidate for gasification and cellulosic ethanol conversion.

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Biology of Giant Reedgrass

Often called giant reedgrass, Spanish cane, wild cane or giant cane, *Arundo donax* is a perennial C3 grass that grows in dense clumps, 5-20 feet tall. The leaves can be 1-2 feet long and from 1-2 inches wide at the base. The leaves appear alternate on the stem and point straight out. Stems are 1/2 to 1+ inches in diameter and are hollow, resembling bamboo. The roots are tough and fibrous and, along with extensive rhizomes, form knotty, spreading mats that penetrate deep into the soil. The flower heads are borne in large (1-2 foot) plume-like terminal panicles. Seed production is very low, and those that do form are considered sterile. Thus, in nature giant reed is primarily vegetatively propagated by rhizomes or viable nodes of mature cane. Immature nodes do not propagate easily.

Arundo is native to the Mediterranean area east through India and other subtropical environments. In the United States, giant reed has been reported to grow from California through the southern states to the eastern coast and as far north as Maryland. While *Arundo* prefers well drained soils where abundant moisture is available, the plant has also been observed to grow well where water tables were close to, or at, the soil surface. Individual plants can tolerate excessive salinity. Although *Arundo* can survive very low temperatures when dormant, it is subject to serious damage by frosts just after the start of spring growth or while still a seedling.

Arundo donax is grown commercially in southern Europe where it is harvested, cured and used to make musical woodwind instruments. In the United States, some biotypes have been grown as ornamentals for the landscape industry.

Production

Although *Arundo* grows widely throughout the southern states and subtropics, little is known about its biology and cultural practices for commercial cultivation. If *Arundo* is to be grown for biomass energy, soil stabilization, or pasture, the following establishment and management practices may be considered.

Figure 2. *Arundo donax*
Credits: Curtis Rainbolt

Because there are few, if any, commercially available cultivars in the United States, and because *Arundo* seed is not viable, *Arundo* is often established vegetatively, by taking rhizome or stem pieces from locally grown biotypes. Commercial production of plantlets through micro-propagation of embryogenic callus has also become available. Large rhizomes with well developed buds can be transplanted directly into furrows 8-10 inches deep in the early spring after threat of frost has past. Mature stem cuttings or whole stems with two or more nodes can also be planted 4-6 inches deep. Row spacings of 36-40 inch centers, with a final population of 4,000-8,000 initial plants/acre seem adequate for complete coverage within the year. Sufficient moisture is needed after planting in the first year to assure a good stand that will last for many years.

Although *Arundo* is noted for not requiring significant amounts of fertilizer nutrients, soil tests should be taken prior to establishment, and nutrients applied similar to corn silage. Approximately 60 lbs/A of nitrogen should be applied after each cutting and is especially beneficial on soils with low organic matter. Soil tests should be followed for P and K since large amounts of these nutrients will be removed if high tonnage is produced.

Arundo has few known disease or insect pests. However, as cultivation becomes extensive, scouting should be conducted on fields. No herbicides are currently labeled for controlling weeds in *Arundo*, but cultivation may suffice in early stages until plants are well established.

Arundo donax can likely be harvested every 7-12 months. However, earlier repeated clipping will not sustain high growth rates, and total production will decline. In South Florida, plantings in late December and into February are ready for harvest by late August to October once heading has occurred.

Potential Yields

Yields of *Arundo* can vary widely depending on available moisture, stand density and period of growth. Initial trials on muck soils at the UF/IFAS Everglades Research and Education Center in Belle Glade, Fla., have produced green weights (50-60 percent moisture) ranging from 20 to more than 40T/A on an annualized basis when harvesting from 7-12+ months of growth. As has been reported elsewhere, once stands are well established, yields may increase.

Production Challenges

In addition to the lack of developed varieties and knowledge about best management practices, many producers of other agronomic crops may be more interested in the control of *Arundo* in their production fields. Culturally, *Arundo* has been reported to be greatly suppressed by repeated close mowing (mowed biomass should be removed from the site) or grazing by sheep or goats. There are no labeled herbicides for control of *Arundo* in row crops, so any chemical control practices will have to be during a fallow period where total vegetative control measures can be used. Herbicides such as glyphosate (in the form of Rodeo® in wetland areas) have proved effective when applied immediately (within 5 minutes) to cut stubble following removal of top growth. Additionally, spot spraying with glyphosate (5 percent solution) or imazapyr (1 percent solution) will also likely be effective. Further detail concerning control of *Arundo* is available in EDIS Publication SS AGR 301, *Giant Reed* (*Arundo donax*): *Biology, Identification and Management*, http://edis.ifas.ufl.edu/ag307.

Estimated Production Costs

Because *Arundo* has not been a commercially grown species, there are no established production costs. It is reasonable to believe that costs of establishment and harvest will be similar to sugarcane, but costs of water, fertilizer, and pesticide should be lower than sugarcane.

Environmental Concerns

Other than the important concern of *Arundo* being a potential invasive or problematic weed, *Arundo*, unlike some cultured crops, does not require large amounts of pesticides or fertilizers. However, repeated cuttings of any high-yield crop will remove high rates of N, P, and K nutrients.

Summary

While little is known of the culture of *Arundo*, and there is guarded concern about its invasive potential, the species has demonstrated the ability to produce large amounts of biomass with moderate inputs. Energy potential is similar to other perennial grass species on a per-unit weight basis.

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