

Arundo Donax As A New Crop For Georgia



“A Summary Report”

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The following is a summary of justification and planned work for a USDA/DOE joint grant solicitation under the Federal Biomass Initiative:

by Bill Anderson

High Yielding Bunch Grasses as Biomass Sources for Fuel and Fiber

This proposal addresses a multidisciplinary project of government, industry, and academic scientists on energy production, potential co-products and alternative uses of giant reed grass (*Arundo donax*) and napiergrass (*Pennisetum purpureum* (L.) Schum.) with estimated yields of over 20 mg/ha/yr. The primary objective of this project is to determine overall suitability and improve the production and efficiency of both crops for renewable energy, ethanol, co-products, and pulp/paper under a range of rural environments in the southeastern US. The economic and environmental feasibility of producing these biomass crops for energy through co-firing with coal or from biogas for electricity and for production of paper pulp is viable today. The production of ethanol and co-products from lignocellulosic material of these crops present potentially valuable future uses that could be developed into an integrated approach that would have great impact in the southern United States rural community, while improving soil, water and air quality. Further research is required to reduce costs in production and avenues of utilization of these biomass feedstocks.

Giant reed has been identified as a prime biomass source for fuel as well as an alternative crop for paper/pulp or wood substitutes. Giant reed is superior to hard woods in fiber characteristics for paper (support prices of \$70 - \$90 Dton⁻¹ have been estimated) and is more cost efficient to produce in areas of the Southeast deficient in inexpensive hardwood. The industry in this region is particularly in need of assistance in reducing shipping costs, as paper/pulp mills struggle to survive using raw materials from outside the region or from overseas. Despite previous research on giant reed, a number of areas require additional research efforts to integrate and optimize the system for efficient production. One major area for research is the determination of available genetic variability within the species and ways to exploit this variability. Also, data are lacking as to integration of giant reed into any process that involves production of ethanol or potential for high-value co-products. Earlier research indicates that giant reed may be an excellent candidate for use in purification of wastewater, remediation of soils, or the potential for phosphate uptake from fowl or animal litter.

Results will supplement current estimates for the development and expansion of an economic assessment for this integrated system. The proposal consists of several distinct sections including: genetic selection; harvesting and field processing; ecologically beneficial production systems; fundamental investigations of structure; composition; and pretreatments affecting lingo-cellulose recalcitrance; and efficient production of energy and co-products.

Specific research topics to address the areas above are: 1) production and yield potential, 2) remediation and ecological effects, 3) harvesting, processing, and transport, 4) cell wall structure and chemistry, 5) microbiology/enzymology for fermentation, 6) pulp/paper quality analysis, 7) genetic improvement potential, 8) economics of the overall system, and 9) technology transfer and education. The sections are integrated with

cost analysis to provide the most efficient production systems for energy and co-products. The economics and potential positive environmental impacts of the system will be determined. Ecological benefits will be assessed from crop production using nutrients from waste and in soils needing remediation as well as determining the positive effects of the plants for carbon sequestration. Best management practices for this non-native species will be addressed.

Duration of research: 3 years

Technical, Management, and Facility: The locations for the tests will be in Tifton, GA under the direction of USDA/ARS (Research Geneticist on perennial grasses), at Jacksonville, and central FL. The plant material will be propagated by West Wind Technology, Inc. (*Arundo donax*). The following work will be performed: Harvest and field processing; Soil, water and plant tissue testing involved with remediation; Cell wall structure and chemistry, potential sugar and co-product production; Pretreatment and fermentation of lignocellulose; Pulp/paper fiber quality; Genetics; Cost Efficiency/Economics and, Education. Overall direction will be shared between Dr. John Woods (West Wind Technology, Inc.), and Dr. W.F. Anderson – (USDA/ARS) with expert consultation from Dr. D. Bransby (Auburn U.). Personnel from public (Clemson University, University of Georgia, University of Florida, Auburn University, USDA/ARS) and private institutions will perform and report this work.