Planting and Managing *Freedom® Giant Miscanthus* for Biofuel Using the Biomass Crop Assistance Program (BCAP)

This fact sheet provides guidance to address common questions and concerns about planting and managing Freedom® giant miscanthus (*Miscanthus x giganteus var. Freedom®*) for biofuel feedstock in North Carolina using the Farm Service Agency's BCAP program.

The NRCS Plant Materials Technical Note "*Planting and Managing Giant Miscanthus as a Biomass Energy Crop – July 2011*" provides more thorough information about producing and managing this grass for biomass.

Freedom® Giant Miscanthus

Freedom® giant miscanthus, developed by Mississippi State University, is a sterile giant miscanthus cultivar, used under license by Repreve Renewables, LLC (RR). Freedom® is only established by planting rhizomes (underground spreading stems) obtained from a certified nursery's stock. Since RR is the exclusive supplier of Freedom® and may only be grown under license, RR will be the primary source of technical specifications on the establishment and management of Freedom® giant miscanthus. Landowners and operators interested in establishing Freedom® are encouraged to contact RR at: *by phone: 888-447-6938,* or by email at *NCFreedom@repreverenewables.com*. Producers may also consult *http://www.NCBiomass.com* for additional information.

Site Location

Although determinations of specific site suitability for the Freedom® cultivar will be determined by NRCS in coordination with RR, in general, giant miscanthus can be established in a wide range of soils. The best production is expected on soils that are well drained, have a pH between 5.5 and 7.5, and have medium to high fertility. Sites with high water tables in the winter or early spring should be avoided as harvesting with large equipment during those times might not be possible. In order to prevent unintentional spread of giant miscanthus, fields should not be located in flood plains, in areas subject to flooding, in areas of potential gully erosion, or near sensitive natural areas. Fields of dry, dormant giant miscanthus can pose a considerable fire risk. A border at least 25 feet wide of tall fescue, clover or annual row crop field must be established near structures, utilities, and other areas to prevent accidental fires from escaping and to detect and prevent the unintended spread of the miscanthus.

Site Preparation

Field preparation is important for successful field establishment. Planning for the establishment of a giant miscanthus field should begin at least 1 year prior to the planting. A soil test to determine pH and nutrient levels should be taken about a year prior to the planting date. If pH needs to be adjusted, amendments should be incorporated at least 6 months prior to planting. If the soil test indicates that nutrient levels are adequate for grass establishment, fertilizer is not recommended for the first two years. If the soil test indicates that nutrient levels are not adequate, the fertility can be adjusted to the recommended ranges.

If the site is currently in crop production, then little site preparation may be necessary. However, herbicide residuals may impact the establishment of giant miscanthus and should be considered. If the proposed site is in pasture or perennial grass, an appropriate broad-spectrum herbicide must be applied to kill the existing vegetation. Follow-up weed control treatment is sometimes needed. The herbicide used and timing of application will vary. An application of pre-emergent herbicide registered for biomass production of giant miscanthus may also be needed.

Prior to planting, the field should be finely tilled to a depth of 6 inches with no hardpan within 18 inches of the surface. Tillage operation and timing will depend upon the site and the herbicides used.

Additional recommendations for site preparation for establishment of Freedom® may be provided by RR.

Planting

RR is the primary source of technical specifications on the planting and management of Freedom® giant miscanthus. In addition, specific information gained from NC Cooperative Extension crop specialists and North Carolina Department of Agriculture & Consumer Services Regional Agronomists may be valuable in establishment and management. In general, rhizomes can be stored for some time, if kept at proper temperature and moisture levels. Fields typically can be planted between February and June, depending upon soil temperature and soil moisture level, while being mindful that frost damage can occur. Rhizomes should be planted between 3 and 4 inches deep in moist soil. Planting rates can vary depending upon many factors. The desired final population is between 4,500 and 5,000 plants per acre. This usually requires planting a minimum of 6,000 rhizomes per acre. Recommended spacing varies between 36-inch rows by 36-inch spacing and 30-inch rows with 30-inch spacing between plants. This spacing can be adjusted depending upon desired final stand populations. A modified corn planter, potato planter, carousel planter or a vegetable planter can be

used to plant rhizomes. After planting rhizomes, the field should be rolled to ensure good soil contact with the rhizomes.

Although fertilizer demands for giant miscanthus are varied in scientific literature, Iowa State University research cited by NC State University crop specialists in establishing interim 'agronomic rates' for energy crops indicates that nitrogen is not needed until year three of giant miscanthus establishment. Currently, the NC Interagency Nutrient Management Committee recommends 60 lbs N/ac/year (after year 3) as an 'interim' nitrogen application rate for giant miscanthus. If animal waste is applied to fields currently in a Certified Animal Waste Management Plan permitted by the NC Division of Water Quality, the 'interim' N rates (60 lbs N/ac/year after year 3) for energy crops must be followed.

Weed Management

Weed control is critical during the establishment year and should include a combination of avoidance, cultivation, and both pre- and post-emergence herbicide applications where registered, labeled herbicide options exist. As with other crops, weed competition can significantly reduce establishment. As the giant miscanthus matures, its canopy should suppress weed establishment and further herbicide applications may not be necessary. Consult with a NC Cooperative Extension crop specialist and RR for further weed control recommendations in the establishment period, as the herbicide options for weed control in giant miscanthus stands in North Carolina are limited.

Biomass Harvest

Producer agreements with biofuels processing facilities which are required for BCAP may specify harvest timing. Although growing season harvest may occur, the optimum harvest times for giant miscanthus are when the plant contains less than 20% moisture, after the plant has fully senesced following a killing frost (typically November-February). Delaying harvest too long in winter can result in damage to emerging shoots, lower stem counts and lower yields. Giant miscanthus can be harvested with a silage harvester, or mowed and baled. Regardless of the harvest method used, a 2-4 inch stubble height is recommended to maximize yield, but avoid picking up the leaf litter.

Prevent Unintentional Spread

Freedom® giant miscanthus is a sterile triploid hybrid of M. sinensis and M. sacchariflorus. Limited information exists on the invasive potential of giant miscanthus in the United States, particularly when grown on a production scale. Until the plant's behavior in the North Carolina agricultural landscape is better understood, mitigation measures are necessary to detect and prevent any unintentional spread. These measures include:

- establishing and maintaining a minimum 25-foot field border around a Freedom® stand;
- covering rhizomes during transportation, planting, and harvest operations when outside the boundary of the production field;
- inspecting and removing all residual vegetative material from equipment when planting or harvesting operations are complete.

To further protect the sterile hybrid values of Freedom®, additional mitigation measures are incorporated into the BCAP project, including seed collection and germination testing; scouting for wild members of the genus Miscanthus in the landscape surrounding biofuel plantings; and annual field visits to monitor potential spread.

The NC Biofuels Center Publication *Voluntary Best Management Practices for Energy Crops* provides additional information for growers about stewardship BMPs to protect their biofuel crops and the environment.

Referenced Literature

USDA-Natural Resources Conservation Service. 2011. Planting and harvesting giant miscanthus as a biomass energy crop. Plant Materials Program, Technical Note 4.

USDA-Farm Service Agency. May 2011. FSA Handbook Biomass Crop Assistance Program, 1-BCAP.

USDA-Farm Service Agency. May 2012. Biomass Crop Assistance Program Final Environmental Assessment SE Giant Miscanthus Establishment and Production.

Biofuels Center of North Carolina. September 2011. Voluntary Best Management Practices for Energy Crops.

North Carolina Dept. of Agriculture and Consumer Services, Division of Soil and Water Conservation. June 2011. Draft Report: Interim Rates for Energy Crops for Utilization by Biofuels Facilities

For more information about the Biomass Crop Assistance Program (BCAP) please contact your local USDA Service Center.