Response to DE-FOA-0001615: Request for Information: Cellulosic Sugar and Lignin Production Capabilities

Company name	Renmatix, Inc.
Company contact	Frank Lipiecki
Contact's details	660 Allendale Road King of Prussia, PA 19406 Phone: 484-751-4013 Frank.Lipiecki@renmatix.com

Category 1: Lignocellulosic Sugars

Question 1: To which types of research entities are you willing and able to sell your lignocellulosic sugar (e.g., university researchers, national laboratories, industry/private sector?) Are there any types of research entities to whom you are not willing and able to sell your lignocellulosic sugar?
Renmatix is willing and able to provide our lignocellulosic Plantro® sugars to university researchers, national laboratories, and to the industry/private sector.

Question 2: What are the maximum and minimum quantities of lignocellulosic sugar you are willing and able to sell (kg)?
Renmatix is willing and able to provide the following Plantro sugars in the listed quantities:

Lignocellulosic sugar product	Minimum quantity, kg	Maximum quantity, kg*
Cellulose monomer	0.2	>1000
Cellulose oligomer	0.2	>1000
Hemicellulose monomer	0.2	>1000
Hemicellulose oligomer	0.2	>1000

*Larger quantities generally available in context of longer term partnerships or agreements

Question 3: What is the sugar concentration in your product?
Concentration is adjusted to the needs of our partners.

Lignocellulosic sugar product	Sugar concentration, wt.%
Cellulose monomer	10-50%
Cellulose oligomer	10-50%
Hemicellulose monomer	10-50%
Hemicellulose oligomer	10-50%

Question 4: What physical form do you sell your sugars (e.g. solid or liquid)?
Liquid.

Question 5: How do you package your lignocellulosic sugars for shipping? Do you ship in bulk?
One liter and one gallon bottles, 5 gallon pails, 55 gallon drums, and bulk totes. The sugars are bio-stable for shipping and storage.

Question 6: What type(s) of biomass do you use to produce lignocellulosic sugar?

Renmatix produces lignocellulosic Plantro sugars from a variety of biomass sources. These sources include woody biomass (e.g. hardwood and softwood), agricultural residues (e.g. cornstover, palm residues, bagasse, etc.), and grasses (e.g. switchgrass, miscanthus, etc.).

Question 7: What process do you use to produce lignocellulosic sugar?
Renmatix produces lignocellulosic sugar using its proprietary Plantrose® process. Renmatix's Plantrose process uses a two-step process to deconstruct the lignocellulosic biomass. The first step consists of hot water extraction and auto hydrolysis of hemicelluloses to C5/C6 sugars. This step leaves most of the lignin and the cellulose intact. The second step uses supercritical water to first solubilize the cellulose from the first step and then hydrolyze it to glucose. After the second step, the lignin contained in the biomass is recovered as a co-product.

Question 8: What details of the scale of your process are you willing to share (e.g. batch and/or continuous/ volumetric productivity)?
Continuous, multi-ton per day scale

Question 9: What is the typical composition of your sugar stream (e.g. glucose, galactose, mannose, xylose, and arabinose) and what is the purity?
The typical composition of the Renmatix lignocellulosic sugar depends on and reflects the composition of the biomass used to produce them. Because the Renmatix process solubilizes hemi-cellulose separately from cellulose, two streams are produced. The hemi-cellulose stream consists primarily of sugars based on the biomass hemi-cellulose composition. The cellulose stream is primarily glucose.

Question 10: Do you routinely test your cellulosic sugar for consistency within and between lots and between feedstocks (if applicable)?
Each lot of sugar is tested for its chemical composition. For materials designated for fermentation, a shake flask ethanol test is performed with wild type yeast.

Question 11: What impurities are present in your lignocellulosic sugar process and what testing do you perform to determine the presence of impurities?
Thermal breakdown products such as furans and organics acids are present in low amounts. These are measured by HPLC.

Question 12: Does you process include a purification step?
Renmatix will customize its processes to meet customer specification and knowledge gained through iterative testing between Renmatix and the customer. Unit operations are added or subtracted from the base process to provide the appropriate sugar quality that is cost effective. The process options are similar to those found in a 1st generation sugar mill.

Question 13: What is the highest concentration in grams/Liter you can provide?
In the standard Renmatix process, $\geq$600 g/L can be provided. With further purification, $\geq$700 g/L can be provided.