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Are there uses for corn stalk residue?

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To my best knowledge, I would like to list the following possible corn stover uses in progressive value-added order:

1. Animal bedding--this one dosen't need a further note.

2. Direct fuel--use as a fuel after hammermilling directly in a boiler furnace, such as being done by Dr. I. C. Anderson of the Iowa State University Agronomy Department.

3. Mulch--to produce potting soil. Dr. Glanville (Iowa State University Agricultural Engineering Department) and a colleague in the ISU Horticulture Dept. were proposing to use vegetative fibers such as corn stover to combat the hog manure problem by using hog manure to compost fibers and produce potting soil.

4. Composite products--for manufacturing particleboard and fiberboard. Commercial particleboard production from baggasse and wheat straw and other types of fiber has been done all over the world. Particleboard is used mainly as a furniture core stock. The main problem of using cornstalks to produce particleboard is one has to use expensive resin binders, particularly methyl diphenyl isocyanate (MDI). You may know that for the past three years our group (biocomposite group) has been conducting fiberboard research by using a mixture of cornstalk fibers and wood fibers bonded by a soybean-based adhesive. Fiberboard is more versatile than particleboard, in that fiberboard may be used as a furniture core stock as well as for interior and exterior door constrcution and sidings for wood framed buildings.

5. Pulp and paper--Heartland Fibers Co. two years ago tried to to set up three pulp mills in Iowa (also proposed to Illinois and Indiana) but could not get Iowa farmers interested to invest. Personally, I don't like to see pulp production in Iowa or in other Midwest regions because the pulping processes pollute. However, pulp and paper manufacturing is a good one if there is a non-polluting process available. There is a process, which has undergone intensive research in the past ten years, and may be a possibility. This process is called the

"organosolv process," in which the raw material is digested with ethanol/water. After pulping, the pulp is washed with fresh ethanol in a closed environment, and the ethanol is recycled. Carbohydrates and lignin are the two main valuable by-products; carbohydrates can be used as animal feed, and lignin can be used as a raw material for producing wood adhesives. Corn stover typically has lower lignin content than wood, and therefore may be suitable for this organosolv pulping process.

6. Liqiud and gas fuels--Gas fuels can be produced by pyrolyzing corn stover very much as in the coal gasification process. I don't know more about this one. My former professor, Dr. David Brink at UC-Berkeley, has been doing ethanol production from lignocellulosics research for more than two decades. His recent research involves using switchgrass and hybrid poplars as raw materials. In the process, the raw material is digested with weak acids very much like a pulping process. Instead of removing lignin in the pulping process, this acid hydrolysis process is to hydrolyze cellulose and hemicelluloses into simple sugars. Simple sugars in turn are converted into ethanol by fermentation. Again, corn stover may have an advantage over woody raw materials because it contains a lower amount of lignin (about 15%) which interferes with the acid hydrolysis of carbohydrates.

7. Chemicals--Sometime in 1950s, Quaker Oats had a patent for producing furfural alcohol from corn cobs. In addition, dissolving pulp (pulp contains very little lignin and hemicelluloses, more or less pure cellulose), can be produced. And from dissolving pulp high valued cellulose derivatives, such as rayon, cellulose acetates, cellulose nitrates are manufactured.

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