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Converting Biomass to High Value Feedstock OFFERS FOOD FOR THOUGHT

Feed is something cows readily devour, but raw biomass cannot be fed to a cow unprocessed.

A farmer usually converts the raw biomass to livestock feed that is safe, inexpensive, easily handled and of high nutritional value. Clearly, **the conversion of raw biomass to biofuel feedstock is a value proposition** by which the farmer can benefit. The conversion process must also take place when feeding biomass to a biorefinery. As industry hungers for options regarding feedstock, the project "**Development of Logistics, Pretreatment and Commercialization of Agri-pellets**" aims to serve up some answers.

"Building on years of collaborating with the wood pellet industry, this activity **addresses the barriers to the commercialization of agri-pellets from wheat straw**," said Gordon Murray, executive director of the Wood Pellet Association of Canada (WPAC). WPAC participated in this study by contributing to project funding and by acting as a partner to advise the research team and review findings.

"**Dr. Shahab Sokhansanj**, the project's lead investigator, approached WPAC in early 2018 about joining in a proposal to Agriculture and Agrifoods Canada," said Murray. "We were attracted because the project would look at **expanding the range of feedstocks available** for our sector by examining the physical characteristics and logistics for various agriculture feedstocks. It would also **develop standards** for product **quality**, physical and chemical **product testing**, and **safe handling** along the supply chain and within manufacturing plants."


Image provided by Real World Media.


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Dr. Hamid Rezaei is measuring the angle of repose of wheat straw.

Specifically, the project objectives are to **analyze those feedstocks** to determine pretreatments by which they can be used as pellet feedstocks and to **develop the logistics** required to collect, transport and store them. A secondary objective is to **deepen the cooperation** between the research team at the University of British Columbia (UBC) and industry for development of standards and best practices specially those related to safety. The study will also conduct research on other agri-residues and purpose-grown energy crops such as **switchgrass**, **willow** and **Miscanthus**. This data from the agri-pellet production will serve to develop supply chain simulation models and best practices on safe handling and storage of agri-pellets.

Teaming up and bearing down

"It is great for us to be able to rely on a highly capable research team at UBC rather than trying to carry out industry research ourselves," said Murray. "This is a prime example of **industry and academia cooperating** for mutual benefit."

The importance of **collaboration** in achieving their objectives is a sentiment echoed by the project's leader.

"The success in **increasing sustainable production** of utilizable biomass, including biomass crops and residues from a wide range of biomass crops, and optimizing the logistics of baling and efficient processing of bales into high value pellets, requires a **team approach**," said Dr. Shahab Sokhansanj, Emeritus Professor at the University of Saskatchewan and adjunct professor in the Faculty of Applied Science (Chemical and Biological Engineering Department) at the University of British Columbia (UBC).

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"The Wood Pellet Association of Canada and researchers at UBC Biomass & Bioenergy Research Group are **working hand in hand** with producers to overcome barriers for a profitable, sustainable enterprise," said Dr. Sokhansanj. "This research identifies **opportunities of interlinking, critical actors** involved in the entire supply chain, from producing a high yielding biomass to a productive biomass processing operation. Biomass pellet storage is a **critical link in the supply chain**, especially for the seasonality of Canadian crops."

Preserving the quality of the biomass while ensuring timely delivery to the final user of the pellet is the promise of a well-engineered postharvest operation. The transport segment of the supply chain encompasses the most fuel and cost intensive operations. The industry-research team strives to **reduce material and process cost** while **ensuring the safety** of the operator and assets.

A new pilot scale pellet plant with a capacity up to 250 kg/hr acquired from Sweden has been installed to test the pelletability of mixture of cop and forest residues. One early deliverable was the production of a video that shows the best practices for managing feedstocks through the manufacturing process to avoid developing explosive gases that could accumulate and cause explosions. The video is equally applicable to woody and agricultural feedstocks and has been widely appreciated by the Canadian pellet sector.

Dr. Fahimeh Yazdanpanah is using Gas Chromatograph to measure off gases emitted during storage of biomass.

Benefit package

While there is much work left to be done, the possible benefits flowing from this study are **well worth the effort**.

"Project success would result in opening a new range of feedstocks to support the pellet sector and create markets for agriculture byproducts, many of which are presently wasted," said Murray. "It would also introduce new safety protocols for the benefit of both wood and agriculture pellet production and deepen industry-academic cooperation."

Pacific Bio pellet plant in Prince George, BC.

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