

Energy Farm

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The short answer is that biomass is any natural material, like a plant, that can be used as fuel. That includes crops like the ones being studied on Lafarge's property, such as maize, hemp, sorghum, miscanthus, poplar, willow and switchgrass, among others. It also includes biodiesel and other naturally derived fuels which aren't part of the Lafarge-PPI studies. *Read more on page 3...*



(1) Hemp (2) Willow (3) Sorghum (4) Miscanthus

Why Use Biomass?

- > **Growth:** Comes from low impact, hardy crops
- > **Shipping:** Farmed biomass represents a local fuel supply
- > **Processing:** Only low energy processing steps are needed to produce solid biomass fuel
- > **Good for the farmer:** These crops are relatively simple for the farmer to produce and can enhance farm revenue
- > **Good for the land:** Can improve soil quality and sequester carbon in the roots
- > **Good for the planet:** Biomass fuels are renewable, and are nearly carbon neutral

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Welcome!

On behalf of the Lafarge Bath Plant and our partners at Performance Plants Inc., I'd like to thank you for taking an interest in our biomass project.

We take enormous pride in the fact that Lafarge is recognized as one of the 100 most sustainable companies in the world. That's why we're so excited about our latest initiative, to demonstrate biomass fuel this fall.

This move is exciting from a sustainability perspective, but it's just as exciting from a community perspective, as it's enabled us to form strong partnerships across the Kingston area. We've joined forces with Performance Plants Inc. to help us make it more economically viable to grow biomass crops on local properties, a partnership that will enhance and strengthen both companies.

And we've been working closely with farmers throughout Eastern Ontario, as well as scientists at Queen's University and the University of Guelph (Kemptonville).

"This move is exciting from a sustainability perspective, but it's just as exciting from a community perspective, as it's enabled us to form strong partnerships across the Kingston area."

Michael Klenk
Plant Manager, Lafarge Bath Plant

Greetings

Since 1996, Performance Plants has been a leader in developing crops with improved productivity and quality. Our partnerships with global seed companies like Syngenta, Pioneer and Scotts Miracle Gro will produce the next generation of food and recreational crops able to maximize seed yields in response to drier and hotter growing conditions.

Replacement of coal with biomass will have the single greatest impact on reducing Ontario's carbon emissions. Together with Lafarge, Queen's University and University of Guelph, we are developing non-food biomass crops that will provide the Lafarge Bath Plant with an environmentally sustainable and locally produced energy source at a price comparable to coal.

We look forward to helping Lafarge become a renewable energy leader in North America.

Peter Matthewman
CEO, Performance Plants Inc.

10 Facts about Hemp

One of the biomass fuels proposed for this fall's demonstration is hemp.

We all know about hemp's exotic history. It is, after all, a member of the Cannabis family. But as more farmers begin exploring the benefits of planting biomass crops, it might be time to for a new perspective on this versatile plant. Here are a few things you may not have known about hemp:

- > With its low clay content and sandy soil, the land just west of Kingston is ideal for hemp growth.
- > Henry Ford grew hemp on his estate, perhaps as a substitute for gasoline.
- > Although it contains no psychoactive THC, hemp is still Cannabis, and it's illegal to grow it in the U.S. Even in Canada, you can't grow it without a permit.
- > There was a time when most sails were made out of hemp.
- > You can grow hemp with minimal pesticides or herbicides.
- > Hempseed oil relieves the symptoms of eczema.
- > Mercedes Benz uses hemp to insulate its car doors. They also mix it with plastic to make mirrors.
- > Hemp milk has higher levels of Omega 3s and Omega 6s than all other non-dairy-based milks.
- > Other hemp-based foods include: cereal, ice cream and frozen waffles.
- > One tonne of hemp contains as much energy as 1.4 tonnes of coal.

The Biomass Project

In the next little while, you're going to be hearing a lot about biomass. So what is biomass, anyway?

The short answer is that biomass is any natural material, like a plant, that can be used as fuel. This includes crops like the ones being studied on Lafarge's property, such as maize, hemp, sorghum, miscanthus, poplar, willow and switchgrass, among others. It also includes biodiesel and other naturally derived fuels which aren't part of the Lafarge-PPI study.

So why all the excitement? Compared to other biofuels, solid biomass is easy to produce. And best of all, we don't have to import it from around the world. We can grow it right here in Eastern Ontario. The idea of producing our own homegrown energy is proving attractive to farmers, who see biomass as a new source of income, and to energy consumers, like Lafarge, who look at biomass's environmental benefits and see it as a way to further their commitment to sustainability and to meet the challenge of climate change regulations.

Although the benefits of biomass are clear, Lafarge officials anticipate a few challenges on the horizon as they get ready to convert their plant for a demonstration of plant-based fuels.

"We're very excited about the practical science that is underway on our real-world farm laboratory..."

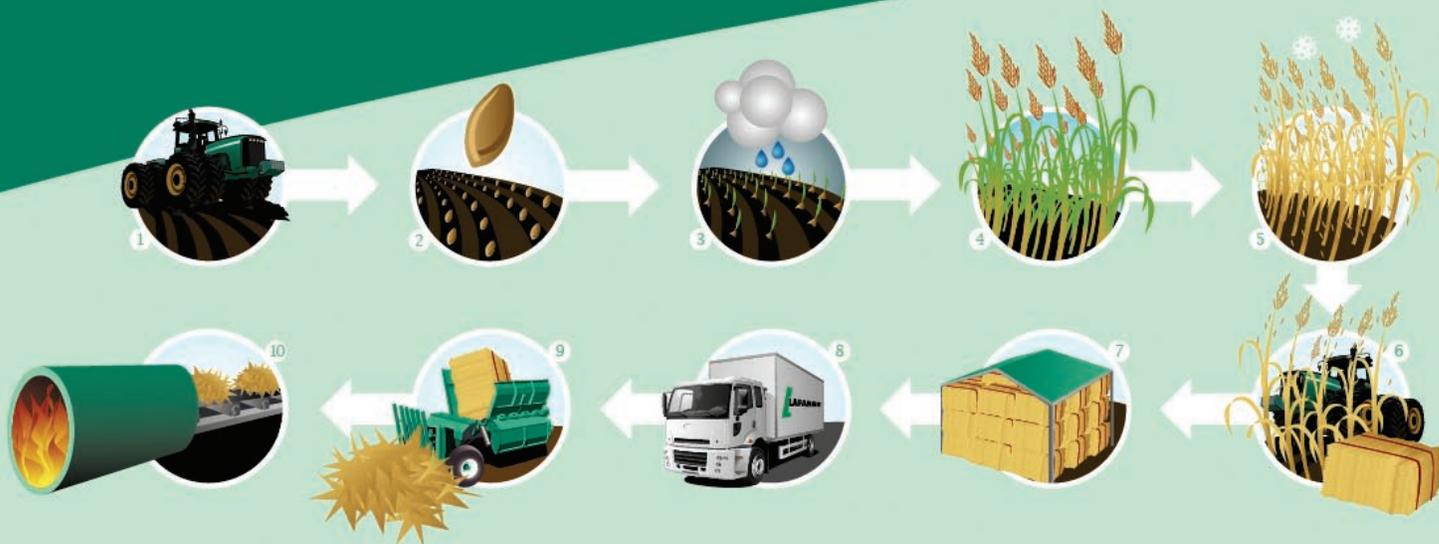
"We know about the benefits of this type of fuel in terms of reducing emissions from published tests," says Lafarge Environmental Manager Robert Cumming. "But, what we need to learn is how to produce these fuels economically for both the farmer and the energy customer. Which crops are best? Can some crops be used in rotation with food crops for pest control, while others are planted on unused, marginal lands? What is the best way to harvest, ship, and prepare the crops for use at Lafarge?"

Years of scientific research have been invested in understanding biomass fuel and the Lafarge-PPI partnership is making it possible to extend this research to a larger scale. "We're very excited about the practical science that is underway on our real-world farm laboratory," says Cumming. "By partnering with farmers and scientists at the University of Guelph, and Queen's (and others), we can study the fuel's life cycle benefits, the potential benefits to wildlife habitat of carefully designed biomass plantings, enhancements to soil sustainability, and many, many other scientific and practical questions."

Diagram Below

(1) Land preparation (2) Seed is planted (3) Water and fertilizer (as needed). (4) Plant grows. (5) Frost. Plant dries & returns nutrients to soil. (6) Plant is harvested and baled. (7) Bales are stored. (8) Bales are shipped. (9) Bales are shredded. (10) Shredded biomass is conveyed to the combustion process. The biomass is combusted. (11) Next year, go back to 1. for annuals and 3. for perennials.

From Seed to Flame



How Green Is My Biomass?



We're hearing a lot about biomass these days, and how it's supposed to be good for the environment. But what, exactly, is so good about it? Dr. Susan Wood, Director of Research Services at Queen's University, has a few of the answers.

Q: So let's get right to the big question: What makes biomass green?

SW: When we talk about biomass in this context, we're talking about plants. Plants are literally green because they contain a pigment

called chlorophyll that is used to convert carbon dioxide from the atmosphere to the molecules needed for plant growth and development.

When the plant reaches the natural end of its life, that carbon is re-released back into the atmosphere through the natural processes of decay, completing the so-called "carbon cycle".

Q: So how is that different from fossil fuels?

SW: The carbon in biomass is newly sequestered - that is - taken from the atmosphere in the very recent past. When biomass releases that carbon through decay or burning, there is the expectation that it will be taken up again quickly, as the next crop of plants grows. The carbon released by the burning of fossil fuels, however, was taken up by plants that grew literally millions of years ago, and it has been sequestered as fossil resources for a very long time. Burning fossil fuels adds to the total carbon in the atmosphere, contributing to global climate change.

Q: And yet, it's all carbon.

SW: Yes. It is all carbon.

The challenge is that while carbon taken up and released from crop plants can balance out, carbon from fossil fuels just adds to the problem because there is simply not enough plant material growing on earth to absorb all the additional carbon released.

Q: So what happens when you harvest a biomass crop? Does that disrupt the carbon cycle?

SW: Well yes, a little. But whether a plant releases its carbon back to the atmosphere through natural processes of decay, or because it is used as a fuel, there is only so much carbon in the top portion of the plant to release. But there is also carbon that is sequestered by the plant that is not released because it is trapped in the roots underground. As a general rule of thumb, there is about the same amount of plant matter in the roots below the ground, as what you see in leaves, stems, and trunks and it too is made up largely of carbon. Over time, the root carbon becomes part of the soil for long term storage. Perennials, like biomass crop species, are best because they store lots of carbon.

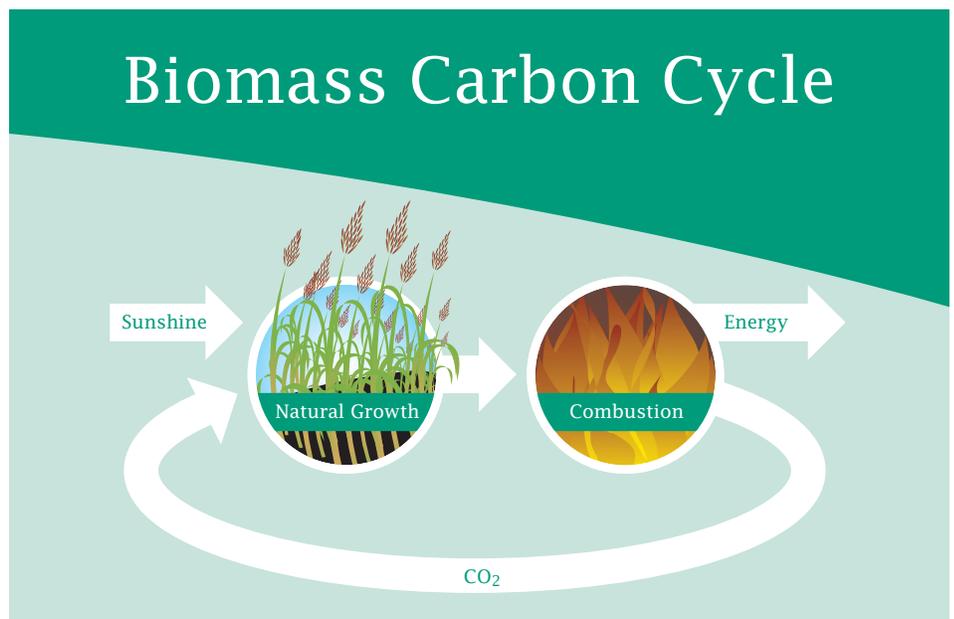
Biomass Carbon Cycle Diagram (right)

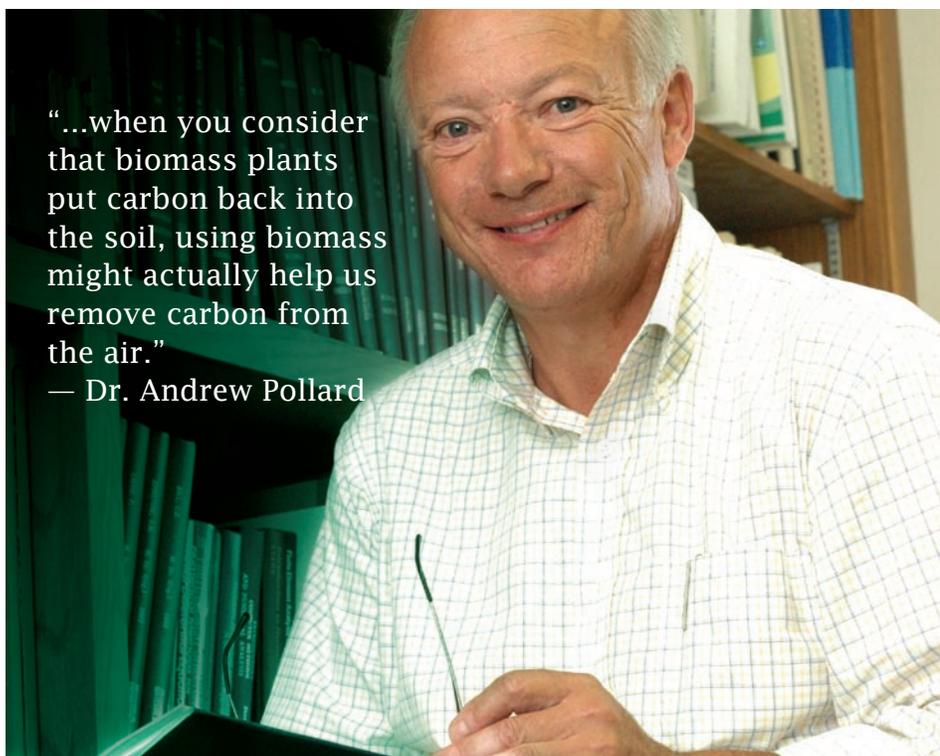
Growth: Low-impact process, using low amounts of fertilizer, and herbicides.

Shipping: To local sites, leading to fewer carbon emissions

Processing: Grinding the biomass into a fine powder leads to better fuel performance.

Carbon is returned to the air, for new plants to use.





“...when you consider that biomass plants put carbon back into the soil, using biomass might actually help us remove carbon from the air.”

— Dr. Andrew Pollard

Green Acres

Biomass critics sometimes say that biomass isn't entirely green; that the biomass fuel production process consumes more than its fair share of fossil fuels. It's true for now that biomass farming will still use fossil fuels to grow, process and ship biomass, but when you compare biomass production with coal production, you'll see that biomass is clearly the greener alternative.

Coal:

- > Mining: Heavy loaders, using large volumes of fossil fuels
- > Shipping and Trucking: Long distances increase fossil fuel use
- > Processing: Crushing and grinding rock hard coal with high-power machines
- > All carbon is released into the atmosphere adding to existing carbon levels.

Biomass:

- > Growth: Low-impact process, using low amounts of fertilizer, herbicides and tractors
- > Shipping: To local sites, leading to fewer carbon emissions
- > Processing: Grinding the dry biomass into a fine powder leads to better fuel performance
- > Carbon is returned to the air, for new plants to use.

Right now, solid biomass fuel production releases approximately 10% of the carbon that fossil fuel production uses, but Dr. Andrew Pollard, Executive Director of the Sustainable Bio-Economy Centre at Queen's University, is looking at ways to reduce biomass carbon emissions to 0%. “If we can derive the energy we use to grow, grind and ship biomass fuels from renewable resources, we can take that 10% right down to zero,” he says. “And when you consider that biomass plants put carbon back into the soil, using biomass might actually help us remove carbon from the air.”

Food and Fuel?

When rising corn prices made tortillas a luxury for impoverished Mexicans in 2006, media outlets around the world pointed the finger at the biomass movement, theorizing that diverting corn crops for ethanol use was causing a global food shortage. The Tortilla Crisis sparked a lively debate about whether or not to give over crop space to biomass when so many people are going hungry.

Ontario Federation of Agriculture spokesman Jim Hair says the food vs. fuel debate is a non-starter. “It's really not an issue,” he says. “We can produce enough food for the population we have.” He looks back on the spike in corn and wheat prices the shook up the market last year and notes that prices shot back down to earth in short order, which, he says, is proof that current supply levels are in synch with demand. “Except for last year, grain prices have stayed low for a few years now,” Hair says. “Farmers are scrambling to make a profit. There is no doubt for most agricultural people that we can meet the world's demand for food products. The breakdown is in the distribution - the social and political factors - not on the farming side. We have no problem with farmers using their land to grow biomass crops. It's not taking food off of anyone's table.”

The Lafarge-PPI project is targeting marginal land, or land not used to grow food crops, further limiting risk to the food supply.



Green in More Ways than One

We know that biomass is good for the environment. But there's a growing sense among Eastern Ontario business owners that's also good for the economy.

"This could be a way of making Eastern Ontario energy independent," says Shelagh MacDonald, executive director of ELORIN, a group dedicated to supporting bio-business ventures in the region stretching from Cobourg to Brockville and north to Hastings County.

MacDonald sees an opportunity for Eastern Ontario farmers to grow biomass crops that can be converted to pellets and used for fuel. "One acre's worth of biomass could heat a home for an entire year," she says.

She envisions a local fuel movement that parallels the local food movement, with people committed to heating their homes and businesses with fuel produced as close to home as possible. "We don't want to be a closed economy," she says.

"We want to be part of the global community. Still, if we could heat our own homes with locally-grown fuel, we could reduce our carbon footprint significantly and provide jobs for local people."

The opportunity is rooted in the region's surplus of marginal land, or land that can't be used for growing food crops. Because many biomass crops can grow in harsher soil conditions than many food crops can, marginal land and biomass are a match made in heaven. "Our marginal land is an advantage because we're not diverting food crops to energy crops so we can create a new market for this region," says MacDonald.

MacDonald has been travelling the region in recent months and has discovered widespread interest in the biomass opportunity. "I've met with hundreds of local farmers," she says. "Many of them are looking for alternatives to put fallow land to use and create a new revenue stream. They're very, very keen to find out what they are."

Several farmers are already on board, committing anywhere from a single acre to 70 acres to biomass crops. The next step is to find a market for those crops. Lafarge is the first high-profile buyer to come on board, which MacDonald views as a good sign. "We need to generate demand in order to get farmers to grow more," she says.

MacDonald is confident that businesses and families will follow Lafarge's example. In the meantime, because the biomass experiment is in its early stages, there are still a few kinks to be worked out. For example, storage will be an issue in the early years. And some crops may not yield much in their first few years.

"Farmers have to be visionary and patient and willing to invest upfront," MacDonald says. "They might not see the benefit immediately, but there's so much innovation going on right now, we believe the investment will be worthwhile."

"One acre's worth of biomass could heat a home for an entire year..."

Ask most area farmers, and they'll tell you that they see an exciting future in biomass. "We're really interested in developing new crops for farmers so that they can remain viable and profitable," says Ontario Federation of Agriculture spokesman Jim Hair. "We see real, real potential in biomass."

So what's got the farmers so excited?



Dr. David Hyndman in a field of switchgrass.

Greener Pastures

Good for the Farmer

"The best thing is that they're easy to farm," says Herb Hart, an L&A County farmer who just planted his first biomass crop this spring. "There's no new technology to learn."

Hart was impressed to learn that biomass crops prosper, even when conditions aren't ideal. "They'll grow anywhere in the world," he says, "even in a drought year. It can get very dry here. Last year, I harvested only 14 bushels of soybeans, compared with 58 the year before. I'm always looking for a drought-resistant crop so that I'm not as dependent on the rain."

"They'll grow anywhere in the world, even in a drought year"

Helping out the cause further is the fact that many biomass crops dry naturally in the field, without the help of natural gas. "I usually spend about \$3,000 on propane every other day in the summer," Hart says. "It'll be nice not to have to do that."

Good for the Land

Most biomass crops adapt well to the soil naturally, without extracting a lot of nitrogen. This makes them a good rotation crop. Farmers understand that it's important to rotate the crops they plant to keep the soil healthy, so they're always on the lookout for new additions to the rotation. "There are only a few things you can put in the soil here," says new biomass farmer Carolyn Wynn. "Anything that can be added to the mix is good news."

Because they're so strong and adaptable, biomass crops thrive where others might not. That makes them perfect for marginal land, or land that can't accommodate food crops. "The marginal land is underutilized land, but it in a lot of cases, it's also prime land," says Hair. "Biomass gives farmers another option to put in their tool box."

Hair sees tremendous potential for hemp and sorghum, a couple of annuals with strong root systems and a proven ability to survive harsh weather conditions. And he's especially interested in switchgrass, a perennial that can last as long as 20 years.

Good for the Planet

Biomass may be gaining ground because it's a renewable resource, but Hart sees additional environmental benefits to the farmer. "It uses few, if any, pesticides," he says, "which is always something we look for."

"It uses few, if any, pesticides, which is always something we look for."

Just as important, he says, is the fact that biomass crops will allow him to decrease his own carbon footprint. "We're an hour and a half from any corn processing plant," he explains. "And the wheat processing plants are all in Toronto, so we sell to the wheat board in Prescott and they deliver it to Toronto by truck. The closer you can get this stuff to an end-user, the better off you are. My farm is just a 20-minute drive from the Lafarge plant, so I can just load up my truck and drop it off myself."

Public Meeting

4 pm to 8 pm
Wednesday, May 06, 2009
Loyalist Golf & Country Club, Bath, ON

How You Can Participate

Your input is important to us. There are a number of ways for you to learn more about the Energy Farm Demonstration, ask questions, and let us know what you think.

At the Public Meeting on May 6, 2009, there will be information on display and to take home with you. There will be representatives you can speak to one-on-one from Lafarge, Performance Plants and Golder Associates, who are doing the technical work for the application. Please take the time to fill out a comment form at the Public Meeting.

All relevant questions and comments will be responded to in a special section of the application to the Ministry of the Environment (MOE), which will be available at www.bathcementplant.com. As you learn more about the Project, you can also send us your questions and comments in writing or by email (please see information below).

After the application is submitted to the MOE, it is posted to the Environmental Registry (www.ene.gov.on.ca) for a 30-day public review and comment period. The comments and questions you provide to the MOE are considered in the approval decision.

If you are also interested in participating in our Community Liaison Committee, please let us know.

This exciting demonstration is important to us and our community. Thanks for taking the time to let us know what you think.

For more information please write to Bath Plant, Lafarge North America, P. O. Box 160, Bath, ON, K0H 1G0 or email: lafargebathinfo@lafarge-na.com visit www.bathcementplant.com



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