

BIOENERGY '94 Field Day

Biomass crops seen as an opportunity for future energy markets

by Susanne J. Brown

The potential of biomass crops to meet future energy markets, from switchgrass plantations as a source for fuel production to short rotation forestry systems as a means to increase crop yields, was under discussion in Ste-Anne-de-Bellevue, September 9.

About 60 people, including government and industry leaders, researchers and producers involved in sustainable-type farming, took part in REAP-Canada's *Bioenergy '94 Field Day*.

The one-day event offered the opportunity to tour Resource Efficient Agricultural Production (REAP) biomass research yield trials currently taking place at Macdonald Campus of McGill University.

While converting agricultural crops, and wood and logging residues into a form of energy is not a new idea, REAP researchers explained how their on-site demonstrations are going one step further. The REAP research trials are concentrated more specifically on identifying and challenging barriers preventing commercialization of biomass for energy systems. For the past three years, REAP-Canada's work in Quebec has focused mainly on assessing the viability of switchgrass, and the potential of willow trees harvested under short cycles in monoculture and windbreak systems.

Most of the ethanol currently being produced in North America is manufactured from grain corn or other starch crops. According to REAP-Canada Economist and Energy Analysts, Patrick Girouard, ethanol can just as easily be produced from switchgrass, a more plentiful, warm season grass.

In fact, comparing yield tonnes to the hectare and litres produced, switchgrass is a more resource efficient alternative for ethanol production than grain corn. (See Table 1.) On one hectare of crop land 10 tonnes of switchgrass can be produced which can be manufactured into 4000 litres of ethanol, compared to corn producing only 2600 litres of ethanol (6.5 t/ha) from one hectare.

Table 1

	Corn	Switchgrass
Yield (t/ha)	6.5	10.0

Ethanol yield (L/t)	400.0	400.0
Ethanol yield (L/ha)	2600.0	4000.0

Another point being calculated into the economic equation is the fact corn has to be planted annually while a plantation of switchgrass can last from five to 15 years which, of course, lowers production costs substantially. Also, once a market is established, no special machinery has to be bought to incorporate switchgrass into a rotation. The type of equipment needed (plow, disc/harrow, baler) is already used on most Quebec farms.

The switchgrass stand at the Macdonald Campus REAP-Canada trial is managed under a one-cut system. Switchgrass can be harvested in either the fall (September-October) or in the spring (May). The cultivars under trial are yielding between eight and 12 tonnes to the hectare and production costs vary between \$38.00 and \$51.00 a tonne.

Switchgrass has "significant potential" for the ethanol fuel market due to its lower production costs, said Girouard. But for now, an unsubsidized industry would need to pay about \$30.00 a tonne to be considered profitable.

However, "with improvement in production and processing, switchgrass has the potential to become economically efficient in the very near future," he said.

In addition to the switchgrass trials, REAP-Canada is also evaluating the economic benefits of biomass production from willow trees in both monoculture and shelterbelt applications.

The willow trees planted for the current Quebec REAP trials were established in 1992, and still need two years of growth before being ready to harvest. Trees in short rotation forestry are harvested in four year cycles, and last for at least 20 years.

However, research is proving monoculture willow plantations to be a costly type of biomass to produce. To incorporate it at the farm level, machinery will need to be modified or bought for both planting and harvesting of the crop, Girouard said.

One point in favour of the willows is they always grow well on swampy land where other cash crops fail. Actual yields from the Quebec trial are not yet available, but REAP scientists estimate, based on their literature reviews of yields obtained in similar experiments in Europe and North America, between seven and 11 tonnes of dry matter per hectare with production costs between \$63.00 and \$95.00 per tonne of dry matter.

On cash crop land, a willow windbreak instead of a monoculture plantation offers a more promising opportunity for the trees, he said.

Preliminary REAP-Canada research indicates that a tree biomass growth in two-row willow windbreaks can be improved by as much as 50 per cent when the trees are harvested in eight year cycles.

The whole willow windbreak system is profitable for energy production when the additional revenues from the cash crops are obtained, Girouard said.

REAP research has shown that using a windbreak on a 30 hectare field can increase crop yields by as little as five per cent which is equivalent for farmers to receive an

additional \$5.00, \$10.44, and \$4.80 per tonne of corn, soybeans and barley (no subsidy included).

"In times when profitability of conventional farming is tight, willow windbreaks represent an interesting opportunity," said Girouard.

Photo Captions

Government, industry leaders, researchers and farmers investigated the willow jungles and switchgrass groves at REAP-Canada's research trials in St-Anne-de-Bellevue in early September.

Patrick Girouard, REAP-Canada Economist and Energy Analysts (far left) explains the purpose of the willow and switchgrass trials to the field day tour group.

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