SP.721 (D-Lab) Fall 2004
Session #35 notes

The Better World Workshop

Guest speaker: Carl Bielenberg

One of the original inventors of the hammer mill project, for which Amy developed significant enhancements.

<See Better World Workshop newsletters, i.e. summer 1996>

In 1975, traveled to Africa after MIT – Cameroon, west Africa. Met some Peace Corp volunteers that wanted a machine to help them dredge fish ponds, to raise tilapia. They'd been doing this with shovels, quite labor intensive, hard to convince folks this was worthwhile since it was much more difficult than getting other protein sources via hunting. This gave Carl an opportunity to develop some machinery, working out of scrap yards.

Meanwhile, met some Dutch development workers that were attempting to introduce sophisticated ag tech. Carl applied to be their "token appropriate technologist." He had great machine shops and resources at his disposal. Accomplished "some good things and some things that are totally out-of-whack."

- Machine to dehull melon seeds. Had been drying, labor intensive dehulling by hand, then grinding. Provides oil and a protein-rich paste for cooking. Challenge to deal with all the different varieties of melon in a single machine. Had some progress but didn't achieve complete results
- Successful technologies cocoa harvesting.

Realized he was dealing with an "ivory tower" situation, too easy to design sophisticated stuff that wasn't easily rolled to other less well-endowed communities. So he founded the Better World Workshop in Bafoussan Cameroon – community with plenty of ag resources and capabilities but no subsidies.

After a couple of years, helped create a metal workers artisan's cooperative. Able to use recycled aluminum to create cookware.

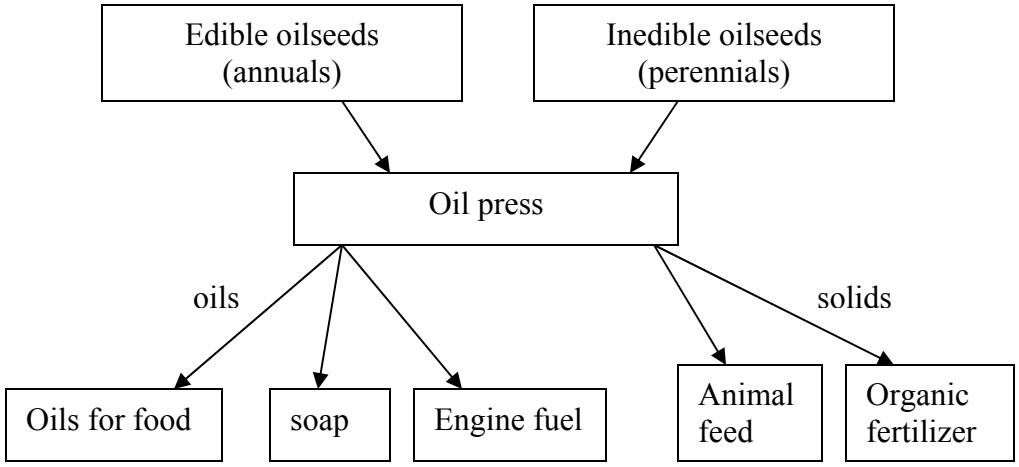
Returned to US in 1981, settled in VT and began working on AT that could be applied in New England. Working with ATI in Washington DC, he identified the Jiko cookstove with ceramic insulation and effective combustion rate control with a door, effectively improved charcoal efficiency by 50%. Able to disseminate this technology quite widely across Africa. Also worked on a foot-operated treadle pump for irrigation, and a low-cost hand operated oilseed press that improved oil yield over existing larger expensive designs.

Outgrowth of this oilseed press work, realized that oil seeds were widely available in many regions in Africa and could be cultivated and processed for diesel fuel. Of all Carl's work, he remains most passionate about this project.

An oilseed press, produced in Africa, costs $100-$200.

Oilseeds: peanuts, sesame, canola, etc.

Not uncommon for a family to consume 2 gal of edible oil per week – key part of diet.



This collection of products spans some of the most important necessities and economic sectors.

Petroleum is 100x as expensive in Africa as in US relative to individual's typical buying power. While oilseeds could become competitive, they're still not quite there, because the oilseeds are high value crops overall (many uses – is diesel fuel the best use?).

In the meantime, he's looking applying steam engine technologies fueled by solid biomass that has little value.

Gasification of solid biomass to run internal combustion engines. This technology was used in Europe in WWI and WWII eras, but then used wood charcoal, big deforestation. Carl is more interested in low-value biomass. Planning assumption, biomass generator can create 100kW.

Summary: Carl's passion is biomass energy. He works with a company that sells institutional-scale woodchip boilers (high schools, universities).

Where does biomass come from? There are regions of Senegal with very little terrestrial vegetation, but there's a large man-made lake with lots of aquatic plants. Fertilizer runoff from nearby sugarcane has created a water hyacinth bloom, looking at ways to harvest this and at the same time offer environmental remediation by pulling this biomass out of the lake.

Discussion and Q&A

Q: How hot does oil have to be to work as fuel?
A: Close to boiling point of water. The reason why you preheat the oil is you

need to melt the waxes in the oil, otherwise the filter would clog in 3-5 hours.

Q: If you create a market for oils from edible oilseed, do people usually also continue to use the solid waste?
A: Surprisingly, not necessarily. You need to work with people to encourage this.

Q: Can you describe the cocoa pod seed-pod project? (re: Samoa)
A: Users said portable, inexpensive…the secret solution is compressed air. No sharp tools, and it only opens the ripe pods with no rotten spots (so it automatically does some quality control). Unfortunately, a patent tangle derailed the technology, and as far as Carl knows it's never been disseminated.

Q: What are pros and cons of biodiesel vs. straight oil engines?
A: Straight oil needs a small diesel component to start the engine and warm up the combustion chamber. Once it warms up, "it depends" on type of oil and specifics of the engine. Note that the inedible oils may create toxic emissions, so he assumes these engines are best used in low concentrations. Also, some of the oils have high NOx and hydrocarbon emissions; though these are carbon-neutral is use, and also due to high oxygen content could permit very clean burning diesel engines.

Carl suggests that coming from another culture, you may be more free of assumed constraints. The outside perspective can help you see the opportunities, and not be so caught up in the obstacles.

Is how things look important? Carl notes that most things in Africa are the product of long periods of cultural evolution, they are very efficient with regard to local materials and local values.

How about stuff looking like what they know? Often very important: upon introduction of electric lights, they dimmed them to make them look more like gaslight.

More broadly, you have to meet people's aesthetic expectations. Sometimes folks want things to look traditional, sometimes they want them to be "modern looking."

The Jiko stove looks simple but some very subtle and complex characteristics. For instance, the ceramic liner has to be able to withstand considerable thermal shocks, ie. Temperature drops when a pot boils over. Learn to work with local clays and fabrication, took a year to develop. Lots of marketing effort, collecting 100s of women for demos to convince them it works. Encourage the ceramic and metalwork folks to work together. While more expensive than a basic metal stove, the charcoal-savings payback is about 6 weeks. Re: marketing, it took almost $1M to introduce this stove.