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Progressing from Terra Preta de Índios to the Whole World

Socioeconomic barriers to implementing biochar projects at commercial scale

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Introduction

In the short time since the first international biochar conference at Terrigal in 2007, biochar has progressed from relative obscurity to international prominence, with its potential for tackling climate change and declining soil fertility achieving widespread recognition and acceptance. Despite this, there is still an extraordinary lack of commercial scale biochar production facilities anywhere in the world.

This creates a significant barrier for the development, demonstration and deployment of biochar products. To reach its full potential, biochar needs to be available for research and demonstration projects in large (kilotonne) quantities rather than the comparatively small (tonnes) quantities typically available for use by research projects to date. This generally limits research efforts to small scale (pots and plots) trials. At a rate of 20 t/ha, establishing a 50 ha field trial would require 1,000 tonnes of biochar.

Transfield Services has been working with Pacific Pyrolysis (formerly BEST Energies Australia) to realize project opportunities based on the slow pyrolysis technology they have developed. Despite strong interest from many parties and investigation of numerous prospective opportunities - well over 20 at last count – getting such projects to financial close and practical implementation has proved to be a surprisingly elusive goal.

In the course of pursuing these opportunities a range of barriers have been encountered. These have been social and economic in nature, rather than technical. They also have a tendency to form self-reinforcing loops which can be difficult to break.

Results and Discussions

The main barriers we have encountered are:

1. Security of feedstock supply

For a commercial-scale production plant to make a return on the capital invested, it must have a reliable supply of feedstock of suitable quality available at an acceptable price. A Pacific Pyrolysis plant requires ~16,000 dry tonnes p.a. (i.e. 2 tonnes per hour).

Typical feedstocks we have looked at are relatively homogeneous woody waste streams with manageable levels of contamination, e.g. municipal green waste, or construction wood waste. However, our experience has been that high expectations around the potential future value of such waste streams often leads to reluctance for the parties controlling them to enter long-term supply agreements at commercially viable prices.

We have developed several stratagems to mitigate this risk. These include constructing business models that allow the feedstock supplier to share in any future upside benefit received by the project as a whole (e.g. increased revenue from energy produced); and modularizing the plant so that if a feedstock supply becomes unviable it is relatively easy to relocate the plant.

2. Technology risk

We are finding that there are numerous groups keen to participate in biochar projects once the prototype plant has had all the teething problems resolved and the technology is proven to be reliable and profitable at commercial scale. This is often called the “Fast Follower” strategy.

Prototype projects encounter several other risks, such as uncertainty about how planning and regulatory agencies will treat such projects.

The problem is exacerbated by the extremely poor track record of AWTs (Alternative Waste Treatment) technologies, which makes investors and project partners extremely sensitive to technology risk.

The solution to this challenge is to structure the first project as a technology demonstration, with improvement of the technology and production of biochar to support research as explicit objectives, rather than success or failure being judged solely by strictly commercial criteria from the outset.

3. Project scale

A challenge for these projects is that their scale – with total capex around the A$10M mark - is awkward for financing. Unfortunately, being not too big and not too small is not just right! It means that relatively inelastic project costs like development permit applications, contract drafting etc, amount to a significant percentage of the total project cost. For the same reason, the transaction costs associated with financing such modest sums makes them unattractive to many financial institutions.

Our solution has included looking for project opportunities that are repeatable and allow standardization of as much of the business model as possible; finding and working with a financial institution that sees the long term value in the biochar industry; and looking for ways to finance portfolios of projects rather than financing each project individually.

4. Piecemeal Government support

One of the purposes of Government funding support for emerging technologies is to help companies like Pacific Pyrolysis address the preceding two challenges and get through the risks and uncertainties of the commercial prototype stage of technology development.

Unfortunately, this objective frequently gets obscured by procedural issues, resulting in funding programs with such long timelines, application & reporting complexities and strict eligibility constraints that they fail to achieve their primary objective. The only solution to this problem is to lobby Governments to simplify these funding programs and focus on outcomes rather than process.

5. Maximizing value from outputs

The main outputs from a Pacific Pyrolysis plant that have commercial value are energy (gas or electricity), biochar, and carbon emission offsets. In Australia (and many other countries) wholesale energy is a relatively low-priced commodity, biochar does not yet have a market presence (so is difficult to value) and the market for carbon emission offsets is voluntary; and very much in its infancy. Maximizing the value from these outputs, a prerequisite for commercial viability, is therefore a challenge. For the energy outputs the key to doing this is to find ways to supply the output directly to the end user at a retail tariff, rather than wholesale to a distributor.

Maximizing the value of biochar as a product requires market development, and a crucial aspect of this is producing enough biochar to support large scale research and demonstration trials, a key objective for us. It is very important to ensure that the quality of the feed material can be controlled, as this is the input to a production process and will (of course) influence the quality of the product – biochar. It is tempting to use “waste” materials that are readily available at low cost, but this strategy brings with it the risk of a contaminated product of no value, and with a damaged reputation in the market.

In the Australian state of New South Wales, as with many other jurisdictions, it is illegal to apply a product that was once classified as waste to land without an exemption from the EPA. We are currently working t obtain such an exemption for biochar.

Finally, maximizing the value of carbon offsets from biochar will require recognition and validation of methodologies for quantifying such offsets, preferably within the framework of national or international schemes for regulating and pricing carbon emissions.

Conclusions

Numerous challenges have been encountered in our efforts to build a commercial scale biochar production plant. We have now developed strategies to address these challenges and are confident that there are numerous viable opportunities for biochar production at a commercial scale.

The key to unlocking these opportunities is to build and operate a full-scale prototype production plant, which will resolve the technology risk, demonstrate the viability of the business model and produce sufficient biochar to drive the next generation of large scale research and demonstration of the agronomic and carbon sequestration benefits of biochar.

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