

## Chapter 4: Biochar – The Policy Context

The push for commercial scale biochar production focuses largely on 1) securing funding via carbon markets and 2) securing subsidies for biochar research, development and deployment, including as a by-product of pyrolysis for bioenergy.

The main lobbying force is the International Biochar Initiative (IBI), which has been effective in promoting biochar at international, regional and national levels worldwide. The IBI is complemented by a number of regional biochar initiatives, including Australia and New Zealand, Canada, China, Europe, India, Japan Mongolia, Thailand and the US. Some of these are rather small, but others more active and growing. These initiatives are comprised largely of academic researchers, business entrepreneurs (including those developing biochar- producing stoves) start-up companies, bioenergy companies with interest in pyrolysis and gasification and carbon offset and other consultancy firms. A small number of NGO groups, including the French NGO Pro-Natura and the US-based Clean Air Task Force are also instrumental. The well-connected but low-profile US bioenergy lobby group Renew the Earth regards itself as the founder of the IBI in 2007, under its previous name, International Agrichar Initiative. Two leading IBI members are on Renew the Earth's Board of Directors.

Finally, several representatives of industrial agriculture and tree plantation interests have expressed an interest in biochar, amongst them the former executive director of the Indonesian Palm Oil Association (GAPKI), Didiék Goenadi, who presented at the IBI's 2008 Conference. In Indonesia, at least three pulp and paper companies, PT Musi Hutan Persada and PT Tanujngemim Lestari Pulp and Paper have taken part in studies looking at the potential of biochar for carbon offsets<sup>i</sup>. Malaysian researchers looking at biochar production from oil palm plantation residues and the manager of the Norwegian company Green Resources, who are investing in monoculture tree plantations for 'carbon offsets' in East Africa, has publicly supported biochar<sup>ii</sup>

### What does the biochar lobby seek?

Fundamental to who, what and how biochar advocacy is carried out is the fact that there are very divergent approaches to the issue of scale. On the one hand, visions for different biochar systems differ according to project scale, ranging from cookstoves to large pyrolysis plants, which are not mutually exclusive. On the other hand, different biochar advocates have different ideas about the scale of global use. Where biochar has been promoted to organic farmers in North America or Europe, for example, the emphasis has been on its use as a small scale, supposedly farmer friendly technology. On the other hand, the IBI foresees very large scale biochar use, sufficient to offset or sequester a sizeable proportion of annual carbon emissions. Some IBI members have openly spoken about using biochar for geo-engineering, whilst others have talked about converting hundreds of millions of hectares to biochar plantations. For example, IBI Advisory Committee Member and Founder of the Society of Biochar Initiatives, India describes himself as a "geo-engineering initiator"<sup>iii</sup>, while former IBI Advisory Committee member, the late Peter Read, called for the conversion of up to 1 billion hectares of land to produce biochar<sup>iv</sup>. Outside the IBI, Tim Lenton and Nem Vaughan from the University of East Anglia described biochar as the most promising geo-engineering strategy in a peer-reviewed article<sup>v</sup> and the head of the climate unit at the European Commission's Joint Research Centre, Frank Raes, has described it as 'geo-renovating' or 'soft geo-engineering'<sup>vi</sup>. However, it appears that IBI members have been increasingly reluctant to use the term geo-engineering or to publicly advocate large-scale land conversion for biochar production, even if this is what they promote – likely in response to the growing criticism of such plans. The most high-profile example of this was an article about the potential for 'sustainable biochar' to mitigate climate change, published in Nature Communications in August 2010 to which senior IBI members had contributed<sup>vii</sup>. The study was widely reported in the media as having shown that biochar from waste and residues alone could 'offset' 12% of

global greenhouse gas emissions every year. For example, BBC News reported that: *"The vision put forward is of a world where waste is burned, where some of the heat from that burning is used to transform waste to charcoal, and where the charcoal is ploughed into soil, increasing its capacity to support crops and locking up carbon for centuries, possibly millennia."*<sup>viii</sup> Neither the authors nor the IBI appear to have challenged or corrected this interpretation. Instead it was left to 21 civil society groups to point out that the data which the authors used for calculating the presumed 12% greenhouse gas offset potential included the conversion of hundreds of millions of hectares of land to produce biochar feedstock<sup>ix</sup>. One of the authors of the original article later clarified the data on which their figure actually was based, which was significantly larger than what the civil societies had assumed<sup>x</sup> – 566 million hectares in total. Those land figures were published neither in the article nor in the supplementary data but could only be deduced from references. It appears that for some biochar advocates the decision to refrain from speaking about large-scale land conversion and geo-engineering in public appears to merely be a tactical decision about communication. As discussed in chapter 3. The basic premise of climate change mitigation through biochar is by its nature based on a large-scale geo-engineering vision.

## Biochar and Poverty

### Biochar and the "Evergreen Revolution":

Much biochar advocacy is focused on promoting biochar as a means of addressing poverty and/or reducing deforestation. According to the French NGO Pro Natura, biochar could lead the way towards a 'Third Green Revolution': *"The Green Revolution...was instrumental in greatly increasing the agricultural output of the lucky minority of farmers throughout the world who had enough money to buy seeds, fertilisers, and access to water for irrigation. Hence the importance of the second wave 'Evergreen Revolution'...directed at the needs of the masses of small farmers...With biochar we now find ourselves on the threshold of a third wave, even more universal in its application."*<sup>xi</sup> In chapter 3, we show that claims about long-term reliably higher yields with biochar production are not backed by the existing science. What is of interest here is the policy context and the assumption made by IBI member Pro-Natura. Behind the claim that biochar can reduce malnutrition and hunger are two assumptions: First, that biochar will reliably increase crop yields. This is explored in chapter 3, where we show that those claims are not backed by findings from field trials. Secondly, that current practices by small farmers are commonly associated with low crop yields and soil depletion and that this is a significant cause of malnutrition/hunger. This second assumption ignores the political, social and economic context behind large-scale and increasing hunger and malnutrition as well as soil depletion and other environmental degradation. It runs counter to the realities expressed by La Via Campesina: *"The contemporary food crisis is not really a crisis of our ability to produce. It is more due to factors like the food speculation and hoarding that transnational food corporations and investment funds engage in, the global injustices that mean some eat too much while many others don't have money to buy adequate food, and/or lack land on which to grow it, and misguided policies like the promotion of agrofuels that devote farm land to feeding cars instead of feeding people."*<sup>xii</sup> Yet the policy context defined by Pro-Natura is not simply one in which international trade and the role of transnational food corporations and agribusiness are ignored: By linking their vision of a biochar 'Third Green Revolution' to the so-called 'Evergreen Revolution', they are linking it to policies which involve more trade liberalisation and more agricultural policies which seek to replace traditional knowledge and practices by small farmers (including, by implication, agro-biodiversity) with agricultural 'techno-fixes', including GMOs<sup>xiii</sup>, to be transferred by Governments such as the US, academic 'experts', many of them trained at or supported by US universities, and undoubtedly, agribusiness. This is illustrated in a recent "Evergreen Revolution Partnership" agreement between the US and Indian Governments<sup>xiv</sup>. The 'Evergreen Revolution' association chosen by Pro-Natura is particularly interesting because of the crucial role played by Cornell University both in biochar advocacy and the Green Revolution. Not only did Cornell University provide much of the training and 'expertise' for the original Green Revolution in South Asia, but they have been given a key role in training for and implementing A Green Revolution for Africa (AGRA), with the new Chair of

the Alliance for a Green Revolution for Africa, Kofi Annan, linking this to the "Evergreen Revolution" blueprint<sup>xv</sup>. Cornell University are, at the same time, a leading centre for biochar research and development, with the Chair of the IBI, Johannes Lehmann an Associate Professor at Cornell's Department of Crop and Soil Science, and they have been awarded funds for deployment-oriented biochar work for example by the Gates Foundation<sup>xvi</sup>, also major funders of AGRA. Biochar as one part of this "Evergreen Revolution" model may well be a more likely prospect than the "Third Green Revolution" based primarily on biochar which Pro-Natura envision.

### **Biochar trials and projects**

A large number of trials are supported by northern biochar interests, and implemented in Southern countries. A small number of those trials are scientific field trials which look at different biochar impacts. The greater number of the so-called 'trials' in Africa, Latin America and Asia, however, have been initiated by companies, biochar organisations and NGOs, not as scientific field-trials with results to be published as peer-reviewed articles, but as projects to prepare for larger-scale commercialization.

For example, the IBI and various companies, have initiated projects in Latin America. A biochar "feasibility" project involving Carbon Gold and the Toledo Cacao Growers Association in Belize is said to have had initial support from the Cadbury Foundation. Also a project in Costa Rica, with support from the IBI, is using a small pyrolysis facility to produce biochar from timber and oil palm plantations with the hopes of a "possibility of eventual carbon credits."<sup>xvii</sup> Embrapa, the state-owned Brazilian Agricultural Research Corporation (affiliated with the Brazilian Ministry of Agriculture), is represented on the IBI science advisory board, and has supported trials through a biochar research program, a "terra preta" conference in 2002, and, as partner with IBI, hosted the 2010 International Biochar conference in Rio de Janeiro.

At least 28 projects and project plans have been announced in 13 African countries.<sup>xviii</sup> The largest are projects initiated by the (Belgian) Biochar Fund in Cameroon and DR Congo and another project by the (French) Centre for Rural innovations in Cote D'Ivoire. Many others are projects initiated by foreign biochar interests, and some with connections to the IBI.

The questions which must be asked are: do these projects actually benefit the mostly subsistence farmers who are brought into the trials? What impact does their participation in an experimental study of biochar have on their lives? Is land and labor diverted taking an overall toll on their productivity? Are they fully informed not only about the purported benefits but also about the potential risks? Are they properly instructed with regards to how to safely handle biochar to avoid breathing dust or otherwise avoid being exposed to risks? Are they fully informed about the results of previous studies? Or are they told biochar is likely or even guaranteed to improve crop yields? As we have seen in chapter 2, the results of field tests suggest that is very unlikely that the results of all or most of the trials would have been a net benefit for participants.

In several cases, very favourable images – smiling farmers with healthy crops etc - are offered with optimistic claims about the successes of these projects initially. But no independent assessments are available. In many cases, no updated information has been published, raising the question whether the projects have been abandoned. In one case, an NGO has announced that their initial biochar project in southern Ghana resulted in failure, despite technical support from three universities but states that a second trial, in northern Ghana has been successful and that they are optimistic that a larger trial will succeed based on "chemical soil analysis"<sup>xix</sup>. However, no data from either of those trials has been published, the 'lessons' learned by the NGOs can thus be neither evaluated nor transferred and it is not clear how farmers were affected by those projects.

Of concern is the potential that subsistence farmers will be pulled into these projects on the basis of hyped claims about the benefits of biochar – and then will be disadvantaged by their participation when the claims prove unwarranted.

## Biochar cook stoves

Another form of biochar promotion to “benefit the poor” involves biochar cookstoves. According to the World Health Organization, indoors pollution from biomass and other solid fuel cookstoves is responsible for 1.5 million deaths a year, over two-thirds of them in South-east Asia and sub-Saharan Africa<sup>xx</sup>. Clean-burning stoves thus need to be a high public health priority. In recent years, clean biomass cook stoves have been increasingly promoted for climate change mitigation as well, because the soot emitted from open cooking fires contributes to global warming. While soot undoubtedly contributes the climate change, the contribution from cook fires in Southern countries remains highly uncertain. Fossil fuel burning as well as destructive fires, such as those set by plantation companies for large-scale forest and land clearance are major contributors to soot globally<sup>xxi</sup>. However, there is no doubt that clean and fuel-efficient cookstoves are vital for people's health, for reducing the time and impact of collecting wood and other biomass and that reducing all forms of soot emissions is important for reducing the speed and level of climate change.

### Biochar cook stoves

Biochar-producing stoves are a type of stove commonly called 'micro-gasifiers' or 'wood gas stoves'. These stoves expose biomass in various forms (depending on design), to very high temperatures such that gases are released and these are then burned in a separate part of the stove for cooking. This reduces (indoor) air pollution, and compared to open cook fires, is a cleaner and more efficient method. Most micro-gasifiers currently gasify all of the biomass except for the ash that is left behind. Those are also called 'char-gasifiers' because the char is used to provide more heat for cooking. Biochar-producing stoves are adapted from this general design and allow the char to be retained and removed instead. No recent independent audit or comparative study of different modern biomass stoves, including micro-gasifiers has been undertaken, which makes it difficult to assess the performance of these different stoves. A recent German report reviewing 'micro-gasifiers' summarizes based on the claims made by manufacturers. All are promoted as clean and efficient, but there is no independent data and no assessment of how practical they are for use. For example, some can only burn pelletized biomass, which may not be easily accessible. The German review was produced in collaboration with the IBI, however the data published (largely taken from developers) suggests that char-gasifying stoves provide more heat for cooking from the same volume of biomass compared to stoves that produce biochar. This makes sense given that more of the biomass is converted to useable energy rather than retained as char residue. Biochar producing stove efficiency should best be compared to other efficient biomass stoves, not to open fires. Their relative inefficiency has also been confirmed in a recent study about biochar stoves published by the UK Biochar Research Centre. They state: "More biomass ends up being used where biochar is produced and this additional collection costs time and removes more biomass. In order to counter these very real disadvantages, the benefits of applying biochar to soil would need to be very evident to the stove user and her household". The UKBRC research included pot trials using biochar from stoves the results of which described as 'somewhat mixed'. In some, though not all, cases crop yields improved when such biochar was applied at a rate of 20 tonnes per hectare. Producing this amount of biochar, not for a pot but for a one hectare field, would require a family to save up biochar from a stove over many decades (by which time, of course, it would not longer be fresh biochar and might not have the same impacts on crops). WorldStove for example, reports that a family cooking on one of their stoves three times daily for a year would produce about 438 kg of biochar over the course of the year. Therefore it would take about 46 years to produce enough biochar to treat a hectare of land with 20 tonnes of biochar. However, efficiency is not the only concern. As the UK Biochar Research Centre's stove study confirms, there are also questions whether different micro-gasifiers meet women's practical needs for cooking. For example, once a such a stove has been lit, the cooking temperature cannot generally be turned up or down and it is difficult or impossible to add more biomass or to switch the stove off early, making cooking more difficult and inflexible. Char removal can also be problematic in some designs, which require it to be either removed hot, risking accidental fires or burns, or to be quenched with water, causing the metal of the stove to corrode.

**Slash and Char:** Another "pro-poor" biochar promotion involves efforts to encourage the use of "slash and char" over slash and burn (swidden) agriculture. This is based on the highly questionable assumption that swidden agriculture is a leading cause of deforestation, and that using biochar will reduce the need to burn off new plots of forested land periodically, enabling subsistence farmers to build and maintain soil fertility in plots that have already been cleared, with increased crop yields.

### Slash and char

A 2006 article by soil scientist Johannes Lehmann, Chair of the International Biochar Initiative claims: "Existing slash-and-burn systems cause significant degradation of soil and release of greenhouse gases...Our global analysis revealed that up to 12% of the total anthropogenic C emissions by land use change (0.21 Pg C) can be off-set annually in soil, if slash-and-burn is replaced by slash-and-char." Yet, to date there are no medium- or long-term trials to compare slash and char with traditional swidden cultivation. As discussed in Chapter 2, estimates of how much carbon is converted to charcoal during wildfires vary significantly and, furthermore, there is so far no evidence that biochar will maintain soil fertility for longer periods than swidden agriculture.

A project by the Belgium-based Biochar Fund and the Congolese NGO ADAPEL in DR Congo was the first biochar project to attract funding linked to Reduced Emissions from Deforestation and Degradation (REDD ), through the Congo Basin Forest Fund. That project was funded as a forest conservation project that would "avoid slash and burn farming." In fact, at least eight national REDD plans have been submitted to the World Bank proposing to effectively ban slash and burn, based on the assumption that it is a leading cause of deforestation. The underlying premises are questionable: Growing international demand for and trade in agricultural products and wood, as well as urbanisation are the leading causes of deforestation, not swidden agriculture practised by small farmers, which in some cases helps conserve rather than destroy forests and their biodiversity. Measures proposed under REDD to halt the practice of swidden agriculture will help destroy the livelihoods of Indigenous Peoples and other forest-dependent communities who have protected and defended their forests from destruction.

The push to replace swidden agriculture with slash and char in the context of REDD and the emerging forest and agricultural carbon markets, is of great interest to the International Biochar Initiative and many of their members, since it appears to offer another way to attract carbon credits and other supports for biochar projects.

The friendly sounding rhetoric surrounding the small scale farmer friendly, poverty alleviation projects - even when these projects often fail to deliver promised benefits - is used to lend support to advocacy for the much larger scale forms of implementation (i.e. it "works wonders for these farmers and therefore will work on a very large scale to address climate change"). This leap of faith is made without any independent audit to assess whether the claims about different projects and acceptance amongst farmers are even justified. The strategy of using small scale projects in developing countries to make biochar more "politically acceptable" is quite explicit in some cases. For example, biochar marketing company Genesis Industries used to describe a "guerilla marketing" strategy with a focus on small farmers as a key marketing slogan for helping owners of pyrolysis units to market their products. Although they have removed this controversial reference from their website, their close links to the film industry together with a 'farmer-friendly' web image suggest that they continue pursuing this strategy. Several biochar projects involving or aiming to involve farmers cite the development of carbon offset projects and methodologies as an aim. Will villagers enrolled in a biochar stove project in Western Kenya, for example, have been told that the project and their participation are to be used for "application for the project to be recognised for carbon trading under the Clean Development Mechanism or other schemes including the voluntary market"<sup>xxii</sup>?

For the most part, it appears unlikely that the small scale farmers are aware even, that biochar is being promoted on a very large scale and especially that their own experiences are being used to promote something much larger and far less benign - the scaling up of commercial biochar production, and global deployment under the guise of climate geoengineering, and the inclusion of soils into carbon markets.

## Biochar advocates' commercial and policy setbacks

In spite of efforts at all levels to promote biochar, so far visions for scaling up production of biochar have not been fulfilled. In 2008, the IBI had a realistic hope that biochar support would be written into a UN climate agreement. Today, such a prospect appears very remote, although, as discussed below, biochar could still be boosted significantly if soil carbon is included into larger carbon markets. Some significant investors in biochar have gone into receivership or had to downsize their operations, such as Best Energies Inc. in the U.S. (now in receivership, although their biochar and pyrolysis business has been taken over by Pacific Pyrolysis in Australia), Dynamotive in Canada and Carbon Gold in the UK both have had to downsize significantly; some biochar firms are increasingly looking for non-biochar markets and uses of char, as in the case of Carbonscape in New Zealand who are now looking at the 'activated carbon' market in the chemical industry. ConocoPhillips remains the only multi-national corporation to have endorsed biochar and offer support (except for some very limited research funding for example by Shell). Many biochar advocates are now hoping to develop small niche markets rather than envisioning exponential global growth of biochar production and use. For example, in a recent article entitled "Getting The Biochar Industry Up to Speed: What Can We Learn From the Pellet Business",<sup>xxiii</sup> (illustrating the synergies with bioenergy in general), the author poses the question: "...Given this background and an abundance of good press, why is so little biochar being produced, sold and used?" The advice offered: serve niche markets, requiring "designer" biochars, and develop small scale affordable pyrolysis units".

Very little commercial production of biochar is currently underway. According to a survey by the Irish consultancy firm C.A.R.E., 20 companies worldwide claim to be commercially producing biochar but only 10 would give a quote<sup>xxiv</sup>. The fact that most biochar research, including field studies has so far relied on traditional charcoal, not pyrolysis biochar, indicates how difficult it is even for researchers to obtain modern biochar for trials.

There are multiple reasons for this, including the fact that experimentation has not verified claims made about biochar, and that biochar thus has no proven benefit, especially to farmers - (although clearly this lack of support has not stopped advocates from continuing to advocate based on these same claims). Another factor that has kept biochar marginal is that the pyrolysis equipment required to produce biochars with consistent qualities has proven costly and difficult to maintain. According to the C.A.R.E. Ltd survey, prices for biochar currently range from £100.-£16,000 per tonne. Even the lowest figure is considerably more than what farmers would expect to pay for organic fertilisers, including manure or compost.

Biochar has won over many "converts", but it has also been met with considerable skepticism. This is in part due to growing awareness of the disastrous consequences of biofuels policies. As evidence has mounted demonstrating that biofuels (ethanol and biodiesel) are driving increased demand for crops, water, soil and land, contributing to rising food prices and hunger, and all the while failing to actually reduce emissions, public opinion has soured. Further initiatives such as biochar, requiring large amounts of plant biomass are increasingly viewed with suspicious reserve. In March 2009, over 147 groups worldwide signed a declaration urging caution against large-scale biochar use and opposing the inclusion of biochar and soils in general into carbon trading<sup>xxv</sup>. Some of those organizations have continued to actively oppose the IBI's efforts and claims and some have published critical analyses.<sup>xxvi</sup>

Finally, and key to the failure of commercial development, is that high hopes were pinned on gaining supports from carbon markets. Those hopes have not so far been realized. The IBI initially focused primarily on the Clean Development Mechanism (CDM), but the future of the CDM is uncertain given that a post-2012 UN climate agreement appears increasingly unlikely to be reached in the foreseeable future. Moreover, far from expanding, the volume of carbon offsets traded through the CDM has fallen for the third year running, by nearly 50% since 2009<sup>xxvii</sup>. Other markets have failed to materialize: For example, in the U.S., the IBI lobbied for the inclusion of biochar into cap and trade legislation, but that legislation failed to pass. The Chicago Climate

### Carbon trading in soils

As global greenhouse gas emissions continue to soar, and evidence of fraud and scams in carbon markets mounts, doubts about and opposition to carbon trading has been growing. Carbon offsetting is at best a 'zero sum game', which allows polluting companies in the North to emit more greenhouse gases as long as they pay for projects which 'save' 'equivalent amounts' of emissions in the South. In reality, however, carbon offset projects tend to benefit those who can afford the specialist carbon consultants and navigate the system, and those who can offer projects large enough to offer 'economies of scale'. That generally means larger companies, including polluting industries, industrial livestock and plantation companies. The European Emissions Trading System (EU ETS) and the Clean Development Mechanism (CDM) combined account for more than 90% of carbon trading worldwide. So far, carbon in soils, farmlands and existing forests has been specifically excluded from trade under both of those schemes, although, large-scale carbon credits are already going to agribusiness companies, mainly for projects related to bioenergy from 'residues'. In recent years, there has been growing policy momentum for broadening the scope and availability of carbon offsets from the 'land use' sector, including forests, forestry, farmlands, grasslands, wetlands and soil carbon, both within the existing carbon markets and new emerging ones. There is also a drive, particularly by the World Bank, to create a plethora of (at best lightly regulated) new carbon markets in which the land use sector, including soils, is to play a major role, with the ultimate aim of trading carbon credits freely between different schemes.

Exchange, the longest-standing carbon market trading in agricultural and soil carbon offsets folded at the end of 2010. The European Emissions Trading Scheme, by far the largest carbon trading system worldwide, continues to exclude soil carbon and other so-called 'carbon sinks'.

### The IBI's new strategy

The IBI and biochar enthusiasts have recently been shifting away from a near exclusive focus on marketing the carbon sequestration "potential" of biochar, to a broader approach that would facilitate the inclusion of biochar on the basis of "multiple ancillary benefits" for agriculture (for example "improving yields", reducing nitrous oxide emissions, minimizing fertilizer runoff, retaining water etc. – all claims that have been made, even if the evidence is scant.)

Debbie Reed, a founder of the IBI and Executive Director of Renew The Earth, has been particularly active in promoting biochar in the UN climate negotiations. Her recent presentation on biochar policy developments<sup>xxviii</sup> advocates for this "landscape based approach: *Such landscape-based approaches will also allow for the multiple ancillary benefits of biochar systems to be considered and acknowledged.*" This appears to be a strategic response to developments within the UN climate negotiations and the World Bank. It embraces the potentials to profit from the strengthening calls within the UN Framework Convention on Climate Change and the World Bank to go beyond individual project-based offset schemes and instead to include soil carbon, agriculture and forestry practices into overarching 'sectoral mechanisms', still based on market mechanisms, most likely carbon markets.

In spite of the evident problems with carbon trading and growing civil society opposition to it, the push to include soils and agriculture and forestry practices into carbon and other emerging 'environmental services' markets, is proceeding, and biochar advocates consider this a most promising direction for channelling their lobby efforts with the expectation that biochar will end up prominently featured – if not only for its proclaimed ability to sequester carbon, then for other reasons.

## Developing Standards

A top priority for the IBI is the development of industry standards and certification, a pre-requisite for commercializing biochar as well as appealing to carbon market developers and participants. Standards and certification in this context mean industry specifications, not a 'sustainability certification scheme'. The idea is, above all, to allow investors and customers to have some idea what they are buying when they purchase 'biochar', which is not currently clear at all. The IBI has appointed Keith Driver, one of the architects of the Alberta Offset System (discussed below), to draft this standard. The IBI website reports on the process: "*IBI's initiative to create transparent, globally-developed and accepted standards for biochar characterization, production, and utilization has completed the most recent round of working group discussions focusing on testing and assessment methods*"<sup>xxix</sup>. They also mention the need to develop a Materials Safety Data Sheet for addressing concerns about handling biochar, and indicate that there are ongoing concerns about "*accessibility of tests to biochar producers of all operational sizes and world locations (cost and facilities locations), and the applicability of soil-type-specific criteria to create a globally-enforceable product standard.*" This last point is especially important given that experimentation increasingly indicates that the wide range of variation in soils and biochar properties, makes it very unlikely that any effective widely applicable "standard" can be achieved.

## Recent international policy developments relating to biochar

### UN treaties – UNCCD, UNFCCC

Around 2008/09, the IBI successfully lobbied parties of the UN Framework Convention on Climate Change to get biochar on the agenda for the post-Kyoto agreement text. Luc Gnacadja, Executive Secretary of the UN Convention to Combat Deforestation (UNCCD) has been a strong supporter of biochar. In 2009, UNCCD made a submission to UNFCCC entitled "Use of biochar (charcoal) to replenish soil carbon pools, restore soil fertility and sequester CO<sub>2</sub>". On the heels of the submission from UNCCD, lobbying efforts resulted in a wave of agenda submissions to the UNFCCC pushing for the inclusion of biochar in a Post-2012 climate agreement, from 20 mainly Southern countries, though many of these do not appear to have actively supported this demand either within UNFCCC or outside. A reference to biochar was briefly included in a UNFCCC draft text, but was subsequently removed. Since then, as indicated above, the debate has moved on towards 'landscape approaches' which would cover soil carbon, forests, tree and crop plantations of all types, agricultural practices, etc. Those are strongly promoted by the World Bank, who foresee a substantial proportion of funding for such an approach to come from carbon markets both inside and outside UNFCCC<sup>xxx</sup>.

Market-based landscape approaches are being promoted through a variety of obscure and barely known acronyms, such as REDD-plus-plus, LULUCF (Land Use, Land Use Change and Forestry) carbon markets, AFOLU (Agriculture, Forestry and Land Use) or REALU (Reducing Emissions from ALL Land Uses), hiding a debate and policy drive which is hardly transparent even to UN delegates, let alone civil society. The more general trend to include soils and agriculture into a UNFCCC agreement and into other carbon markets is proceeding. At the recent UN Framework Convention on Climate Change COP 16 in Cancun in December 2010, negotiations under the title of 'Land Use, Land Use Change and Forestry' (LULUCF) sought to extend CDM funding for land sinks beyond the previously limited "1%, afforestation and reforestation only" to enable countries in the future to purchase a larger percentage of credits, for a much broader array of land use practices. These would expand supports for afforestation and reforestation (tree plantations), and also market carbon from soils, cropland management, 'revegetation' (any type of plantation), forest management (industrial logging) and grassland management. Though the specific text proposals were not adopted, they were resubmitted for negotiation at the UNFCCC SBSTA meeting in Bonn.

## World Bank

The World Bank has long been a 'pioneer' of carbon trading. They set up the Prototype Carbon Fund in the late 1990s, which became operational in 2000 and served as a 'blueprint' for the Clean Development Mechanism (CDM). In 2002, they set up the BioCarbon Fund, which has been providing carbon finance to 'carbon sink' projects – initially only 'afforestation and reforestation' schemes, many involving monoculture tree plantations, which also fall under the CDM. In November 2010, the World Bank announced their first ever soil carbon offset project – not a biochar project but one which appears to involve a long-standing project in Western Kenya and which now forms part of the BioCarbon Fund. Shortly thereafter, at a side event held at the UNFCCC COP 16 in Cancun, World Bank President Robert Zoellick announced a multi-million dollar fund to help emerging market countries set up their own carbon markets, called 'Partnership for Market Readiness' and he included a strong statement for the inclusion of agricultural mitigation activities, including soil carbon sequestration, within these markets. The World Bank in general is playing an active role in shaping both agriculture and carbon markets. They have committed themselves to “expand carbon finance in areas such as soil conservation and work on standardized baselines”<sup>xxxix</sup> Recently the World Bank has partnered with the IBI and Cornell University (where IBI Chair Johannes Lehmann is based) to conduct a survey of biochar projects in developing countries, and a detailed “lifecycle assessment” of their potential for greenhouse gas mitigation.

## Unregulated international offset markets

While the CDM contracted by nearly 50% and total global carbon trade declined by 1.3% between 2009 and 2010, unregulated or voluntary carbon offsetting grew by 34% in the same year<sup>xxxix</sup>. Yet compared to the regulated carbon markets (above all the EU Emissions Trading Scheme, followed by the CDM), the voluntary carbon market remains small. In 2010, it was estimated as being worth \$424 million, out of a total global carbon market of around \$142 billion<sup>xxxix</sup>. Of particular interest to investors and to the IBI is the Verified Carbon Standard (formerly Voluntary Carbon Standard). Its aims include “establishing a global benchmark for quality offsets [and] providing a framework to bring coherence to the voluntary carbon market”<sup>xxxix</sup>, i.e. to serve as a 'certification system' for voluntary carbon offsets. Out of 25 methodologies adopted by the VCS, 9 fall into the “Agriculture, Forestry, Land Use Category”, most of them related to forestry. In 2009, Carbon Gold submitted a proposed biochar methodology to the VCS. This received little support, with some of the details being criticized even by the IBI, and appears unlikely to be progressed further. However, the Carbon War Room, funded by Richard Branson, which has partnered with the IBI, as well as the Biochar Protocol, co-sponsored by ConocoPhillips and working closely with the IBI, both regard developing new biochar methodologies for the VCS as well as the Alberta Offset System (discussed below) as their top priorities.

## Some recent key national and regional policy developments relating to biochar

### Australia

Biochar has probably featured more highly on the political debate in Australia than in any other country. It formed a keystone of Malcolm Turnbull's policy on climate change as Leader of the Opposition and is being strongly advocated by Tim Flannery, head of the government's Climate Change Commission (and until recently board member of biochar company Carbonscape). Both the government and the main opposition support large-scale carbon offsets involving agriculture, forestry and soil carbon and successive governments have funded biochar research and development, the biggest grant having been for AUS\$1.4 million (US\$1.5 million) for biochar research made available to the Commonwealth Scientific and Industrial Research Organization (CSIRO)<sup>xxxv</sup>. The proposed Carbon Farming Initiative, which will be voted on by the Australian Parliament in June, seeks to establish a publicly administered and regulated carbon market for Australia to utilize both domestic and international agriculture, forests and soils for emissions

"offsets". It is a sectoral carbon market unrelated to any emissions cap. The Initiative would introduce soil carbon offsets with 'few strings attached', i.e. without any public consultations on projects and setting aside most of the remaining 'safeguards' of the CDM or European Emissions Trading Scheme (which exist at least on paper). For example proving that projects have to provide benefit additional to what would otherwise have happened, will likely not require much demonstrated proof. The consultation document specifically embraced biochar. Some, like the Organic Farmers Association, claimed enthusiastically "A Soil Carbon Offset Scheme has the potential to sequester all of the 537 million tonnes of CO<sub>2</sub> that Australia emits and generate \$70 billion in Carbon Credit payments to the Australian economy.<sup>xxxvi</sup>" claim that Australia will be able to (inexpensively) offset all of the country's emissions by shifting to more "climate friendly" agricultural and forestry practices, although in the absence of any emissions cap it is not clear who would want to buy the new offsets.

### Canada/Alberta

In 2007, the government of Alberta introduced a mandatory Greenhouse Gas Reduction Programme. The programme's name is misleading in that it does not mandate any greenhouse gas reductions. Instead, it requires a small number of large polluters to reduce their carbon intensity or, if they fail to do so, to purchase carbon offsets through the Alberta Offset System, or to pay into a Climate Change and Emissions Management Fund set up by the provincial government. Reducing carbon intensity means reducing emissions per 'production unit' – even if greater production will mean overall more carbon emissions. The legislation and the Alberta Offsets Scheme are closely linked to the government's policy on tar sands expansion, with carbon offsets being of particular interest to investors in tar sands extraction megaprojects, considered to be among the most destructive projects on earth in terms of their impacts on the environment, public health and the climate. At a meeting of climate activists in 2010, IBI Advisory Committee Member Lloyd Helferty announced that "Biochar could offset Canada's tar sands industry for 14.5 years."<sup>xxxvii</sup> Development of a biochar carbon offset methodology for the Alberta Offset System, together with the Verified Carbon Standard, has been identified as a top priority by the Biochar Protocol, founded by ConocoPhillips Canada and the Carbon War Room to develop such methodologies. A biochar methodology appears to have been submitted to the Alberta Offset System, but has not yet been published for consultation. There is, however, a significant chance that such a proposal would effectively be rubber stamped, much to the delight of tar sands investors who are eager to have access to unlimited quantities of inexpensive offsets. ConocoPhillips, one of the lead investors in tar sands, previously provided \$22.5 million in funding for bioenergy and biochar research at Iowa State University<sup>xxxviii</sup>. Furthermore, the IBI has hired one of the architects of the Alberta Offset System, Keith Driver, to develop biochar standards, as mentioned above.

### China

The **Panda Standard** is being set up as China's first voluntary carbon offset standard. According to its website: "The China Beijing Environment Exchange (CBEE) and BlueNext founded the Panda Standard, as the first Chinese domestic voluntary carbon standard, designed to provide transparency and credibility in the nascent Chinese carbon market and to advance the People's Republic of China (PRC) Government's poverty alleviation objectives by encouraging investments in China's rural economy"<sup>xxxix</sup>. The land use sector is to play a key role in the Panda Standard, with a specification for Agriculture, Forestry and Other Land Use having been developed, and consultations invited. Biochar was specifically mentioned. So far, the Panda Standard has launched a first pilot project, involving 'bamboo reforestation', with financial support from the French Development Agency AFD and the French Global Environment Fund (FFEM)<sup>xl</sup>

### European Union

The EU has taken on binding emissions reduction targets, which have translated to an alarming degree, into subsidies and mandates for bioenergy, including biofuels. Biochar advocates recognize that these mandates and subsidies, especially pyrolysis and gasification, are one of their

most promising avenues for achieving supports for biochar in Europe. The development of second-generation (solid-to-liquids) biofuels is being strongly promoted, including through the EU's Renewable Energy Directive. Pyrolysis and gasification research and development attracts public support through the EU and member states in this context, although the bio-oil and syngas produced through pyrolysis and most types of gasification need to be refined further before they can be used as transport biofuels. In the UK, the UK Biochar Research Centre (members of the IBI) received core funding of £2 million (\$3.26 million) from a government research council<sup>xlii</sup>, as well as additional funds from another UK government research council, the European Regional Development Fund, a Canadian Crown Corporation and Shell Global Solutions<sup>xlii</sup>.

The European Commission's Joint Research Commission, which provides scientific and technical advice to the European Commissions and EU member states, has advocated for biochar, organizing side events at the UN Framework Convention on Climate Change COP 15 with IBI member participation<sup>xliii</sup>. They published a research paper on biochar<sup>xliii</sup>. Alarming, the head of the Commission's climate change unit has openly advocated for biochar as viable climate geo-engineering technique – referring to it as 'geo-renovating' or 'soft geo-engineering'<sup>xliii</sup>. The EU's North Sea Region Programme includes a "Biochar: climate changing soils" project to "raise awareness and build confidence in black carbon as a way of capturing carbon and increasing soil quality and stability". They also seek to establish "biochar competence centers" in countries in the region, supporting biochar research at research institutes in seven EU member states.<sup>xliii</sup> Furthermore, the EU's 7<sup>th</sup> Framework Programme includes funding for biochar research and some funds for biochar commercialization have been made available by member states under the European Rural Development Programme<sup>xliii</sup>.

Although the EU Emissions Trading System does not permit 'land based' carbon credits, including those from soil carbon, there are some indications that this position might be reviewed in the future, depending on international developments<sup>xliii</sup>.

### New Zealand

The NZ Government, through the Ministry for Agriculture and Forestry (MAF) has invested substantial funding into biochar research with a clear mandate to further commercialisation. This includes a grant of NZ\$3.13 million (\$2.56 million) to the NZ Biochar Research Center. Several NZ universities, especially Massey University, as well as different Crown Research Institutes are involved. The 'biochar model' promoted in New Zealand primarily seeks to use residues from tree plantations, i.e. additional finance for plantation companies, possibly new tree plantations for biochar production, and also biochar use aimed at reducing methane and nitrous oxide emissions from pasture. Landcare Research has been particularly active in developing proposals and support for agricultural and soil carbon offsets more generally. Agriculture will likely be fully incorporated into the NZ Emissions Trading Scheme (NZ ETS) in 2015 and a proposal for a biochar methodology can be expected.

### United States

**Cap and trade legislation:** Climate legislation passed in the House of Representatives, but failed to pass in the Senate in 2010. These bills sought to enact cap and trade, and to provide large quantities of offsets (2 billion tons) with the bulk to be derived from (mostly domestic) agriculture and forestry, (which were in turn exempted from any cap on emissions). The Senate version of the climate bill specified biochar among eligible offset technologies. In addition, it offered finance for research and development on biochar and even included a separate title on "rapid mitigation" featuring biochar. Those proposals were actively supported by the IBI, with their Chair, Johannes Lehmann testifying to a House Select Committee in 2009<sup>xlix</sup>. None of these proposals however were passed into law.

In general, the U.S. Government has been, and continues to be, a major proponent of marketing soil, agriculture and forest carbon, advocating for this in national and international policies and investing considerable sums in research and development to facilitate the measurement of carbon

fluxes. The Chicago Climate Exchange had taken the lead in trading offset credits for agriculture (especially for industrial no-till practice<sup>1</sup>) within the voluntary markets, with the expectation that experience would then carry over to mandated markets – which have subsequently largely failed to materialize. The Chicago Climate Exchange itself closed and was sold off. Several regional trade schemes have emerged or are in planning stages however. The US Department of Agriculture has recently sought consultation on “Quantifying greenhouse gas emissions and carbon sequestration for agricultural and forestry activities”, including soil carbon<sup>i</sup>. During a speech at the UN Climate Conference in Cancun in December 2010, U.S. Department of Agriculture Secretary, Tom Vilsack, promised an 'aggressive agenda' to “*provide American farmers and landowners with information on how protecting the environment through actions such as carbon sequestration...can also bring economic savings*”, including an evaluation of “*how emerging voluntary and state greenhouse gas markets and USDA conservation programs can work in concert*”<sup>ii</sup>. Tom Vilsack previously expressed support for biochar as a speaker at the North American Biochar Conference in 2009 and USDA issued a press release for the occasion expressing strong support for biochar research and development<sup>iii</sup>.

**Other legislation:** A stand-alone biochar bill (Water Efficiency via Carbon Harvesting and Restoration [WECHAR] Act of 2009 ) which focusses on subsidies rather than carbon offsets was put forward but has not been progressed,

**Regional carbon market initiatives:** The West Coast Regional Carbon Sequestration Partnership (WESTCARB) describes itself as “*a collaborative research project bringing together dedicated scientists and engineers from more than 90 public agencies, private companies, and nonprofits, co-funded by the US Department of Energy to characterize regional carbon sequestration opportunities and conduct technology validation projects*”. It is managed by the California Energy Commission and covers seven US states as well as British Columbia in Canada. WESTCARB does not administer carbon offsets, but helps to develop the policy drive and methodologies for introducing them, with 'terrestrial carbon storage' as a key priority. The California Energy Commission recently commissioned the Climate Trust (who describe themselves as an “innovator and quality leader in the carbon offset market”<sup>liii</sup>) to write a report for WESTCARB about “Carbon Market Investment Criteria for Biochar Projects”. This is currently available in draft form<sup>liv</sup>, with a published factsheet that states enthusiastically: “*...Given these and other pathways for reducing emissions, at its maximum sustainable potential, biochar could annually reduce 1.8 Gigatons of carbon dioxide equivalents emissions or 12% of the worlds GHG emissions. This, is based on the assumption that one metric ton of biochar contains .8 metric tons of carbon and 80% of this carbon will remain sequestered in biochar after 100 years*”<sup>lv</sup>.

**Government funding for biochar research and development:** The U.S. Department for Agriculture and the U.S. Department for Energy, as well as some state governments have been funding biochar as well as broader pyrolysis research and development through various initiatives, including through the Biomass Research and Development Initiative which, amongst other biochar funding, has provided \$5 million to use beetle-damaged trees for biochar and energy<sup>lvi</sup>

## Synergies with coal and biofuels

Many companies involved with biochar are essentially bioenergy companies, or industrial forest/agribusiness companies, with biochar being just one facet of a broader portfolio of interests. These companies are simply looking for means to profit from char residues that might

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<sup>1</sup> Industrial no-till agriculture has been introduced across millions of hectares, particularly in North and South America and especially to grow corn and soya. It is claimed that soil carbon is protected and increased by not tilling soil, although scientific findings about this are far from consistent. Tillage is replaced with increased use of herbicide, with weeds being poisoned, not ploughed. Herbicide-resistant GM crops are commonly grown and the practice has been advocated by Monsanto for several decades.

otherwise languish – or even pose a messy disposal problem. A look at some of the startup companies that have arisen (and in some cases, subsequently failed) is revealing (see table). Equally revealing is a look at attempts to capitalize on synergies between biochar and the coal industry. Although the IBI's definition of biochar is strictly limited to biomass sources of black carbon, various companies, including ones linked to the IBI are seeking to combine biochar with the agricultural use of coal power station residues.

**ICM Inc.** ([www.icminc.com](http://www.icminc.com))

U.S.-based ICM Inc is mainly an ethanol company seeking to diversify into other forms of bioenergy, including gasification. They installed a pilot gasification plant at a landfill site in North Dakota and are now advertising similar gasification units for sale. They promote, amongst other things, a 'char byproduct' for carbon sequestration and as soil amendment.

**Best Energies** ([www.bestenergies.com](http://www.bestenergies.com))

Best Energies Inc. were based in the U.S. with a subsidiary in Australia. They began as one of the primary startups promoting biochar, but are now in receivership. A look at their approach, claims, and portfolio of interests and marketing is illustrative however. Best Energies invested mainly in biodiesel but also in biochar and 'green charcoal', i.e. charcoal as fuel and they claimed to provide carbon offsets<sup>lvii</sup>. Several of their directors came from Union Carbide and Dow Chemical. The Best Energies website stated: "*We are well positioned to win the current land grab in next-generation fuels.*" Their biochar and pyrolysis business has been taken over by Pacific Pyrolysis in Australia.

**Alterna Biocarbon** ([www.alternaenergy.ca](http://www.alternaenergy.ca))

Based in Canada with a subsidiary in South Africa, Alterna owns and uses a technology called "Enviro Carbonizer" in a small industrial facility in South Africa and another demonstration facility in B.C., Canada. Their website claims: "*Alterna Biocarbon is a company focused on the manufacturing of biocarbon from products, such as wood, municipal and agricultural waste and tires. Biocarbon, also called biochar or charcoal, is a renewable replacement for coal manufactured for industrial markets...There are many markets for the product including biochar (agricultural applications), activated biocarbon, and energy pellets.*" The company is owned in partnership with "All Wood Fibre", which procures and markets woodchips, stating "*Our services are utilized by the major forest products, logging, lumber, pulp and paper, and bioenergy companies.*" \_Alterna Biocarbon have not yet produced biochar commercially, only for research purposes.

**Eprida** ([www.eprida.com](http://www.eprida.com))

Founded in 2002 as a Delaware Corporation in Colorado, they were the first ever biochar company. Eprida has been involved in different biochar research collaborations and has so far produced biochar for research only. According to their website, they have developed a so-called ECOS technology, which involves combining pyrolysis biochar with chemicals scrubbed from coal power station flue gases to produce an ammonium bicarbonate fertiliser. Genesis Industries hold the license for Eprida's pyrolysis system.

**CoolPlanet Biofuels** ([www.coolplanetbiofuels.com](http://www.coolplanetbiofuels.com))

CoolPlanet are a California-based biofuel company developing biofuels from biomass fractionation (related to gasification). They state on their website: "*Imagine driving high performance cars and large family safe SUV's while actually reversing global warming.*" GE, NRG Energy, ConocoPhillips and Google Ventures are investing in CoolPlanet Biofuels. Their technical advisory board is made up of Leio Manzer (DuPont Fellow), David Austgen (formerly with Shell), Raymond Hobbs, Cliff Detz (formerly with Chevron) and Ron Sills (formerly with BP and Mobil). Cool Planet produces small amounts of biochar in their process, but they use that to argue the claim that their fuels are "carbon negative".

## Mantria Industries LLC

Mantria Industries LLC, a subsidiary of Mantria Corporation, claimed in 2009 that they had opened the world's first commercial-scale biochar production facility<sup>viii</sup> and they advertised 'EternaGreen' biochar for sale. Mantria Corporation was set up as a partnership with Speed of Wealth LLC and Mantria Industries claimed to invest in the BioRefinery industry and specifically in biofuels and biochar, focussed around carbon credits. There is no evidence that they ever sold or even produced biochar. In 2009, the Securities and Exchange Commission filed a court case against them for 'operating a Ponzi scheme' and the scale of the fraud allegations has since increased to \$54.5 million. Following the announcement of this investigation in 2009, the IBI published a statement claiming that their knowledge about Mantria's biochar activities was limited to what was in the media, that they had not supported their projects and received no funding from them<sup>lix</sup>. However, previous, uncontested, media articles had described the IBI as a supporter of Mantria's biochar activities<sup>x</sup> and the IBI website hosted a full 'project page' for Mantria. There are no reasons to believe that the IBI would have had any idea about the apparently fraudulent nature of the business. However this example shows the ease with which such a dubious company could take advantage of the positive image created around biochar and even be promoted by the IBI, without any checks on the nature of their business.

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