

## **Technology and politics or soil carbon**

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### **Compromises and limitations of Kyoto protocol**

The only viable aim for a global agreement on greenhouse gas emission is to be globally neutral.

At the time of the Kyoto protocol this seemed an impossible aim so the outcome (based on political reality) was a compromise in which the majority of developed countries agreed to a small reduction, typically a 5% reduction, below 1990 emissions levels. Developing countries were excluded from a formal commitment.

The result has been a failure. We are putting carbon dioxide into the atmosphere at a faster rate than ever before.

There are 3 reasons.

- 1- The 5% target was inadequate
- 2- Most countries have failed to reach even this low target
- 3- The large increase in emissions from developing countries has far exceeded any small saving from the developed countries.

Most developing countries, particularly China, have benefited from rapid industrialisation and hence an increase in emissions. This is a fact of life and there is no likelihood of this changing in the near future.

While many countries, particularly in Europe have introduced trading schemes the results have been disappointing for a simple reason. There are not enough carbon credits for polluters to buy. To avoid difficulties Governments have softened the rules on how much carbon is allowed.

There is now almost total disillusionment with the Kyoto process and it seems inevitable that it will be replaced by a revised approach.

### **Kyoto and soil carbon**

At the time the Kyoto protocol was formulated, soil carbon was not considered. Forestry however was accepted as a valid carbon sink and rules were developed for its accounting.

Many Governments now recognise that soil carbon may be critical for controlling greenhouse gas levels, however there was no consideration for the special nature of soils carbon. In the absence of

specific rules Governments wishing to adopt soil carbon strategies have simply adopted the rules for forestry. Certain concepts particularly those of additionality and permanence may be valid for forestry but are simply not applicable to soil carbon.

## **Climate change sceptics and deniers**

Climate change sceptics and deniers have been particularly effective in disrupting progress on climate change. They are typically large and powerful organisations with vested interest of right wing fanatics. They have promoted with some success either that climate change is not happening, if it is happening the impact is small and is not caused by manmade emissions (e.g. it is part of a natural cycle).

But they are fighting a losing battle. The costs of natural disasters specifically floods droughts and fires have increased dramatically, this is undeniable as figures from the insurance companies show. It is a reality which even the sceptics cannot deny. It is gradually becoming accepted around the world that this is the result of climate change. It is inevitable as awareness spreads that Governments around the world will take climate change more seriously and demand action (despite the continued disruption by the sceptics).

We can therefore expect a major rethinking of climate change strategies and a desire to reach a new global agreement to replace Kyoto.

## **Replacement for the Kyoto Protocol**

The major thrust in combating climate change has focused on alternative energy sources. At this moment current green technologies simply cannot provide energy required on the required scale to replace fossil fuels on a global scale. True some countries have been able to slow the rate of growth of their carbon emissions but globally these efforts are dwarfed by the increase in fossil fuel use in developing countries.

However technology is moving ahead rapidly, we only have to look at the dramatic changes in technology unheard of 50 years ago, the jumbo jet, fax, computers, mobile phones etc. It is reasonable to believe that the chances of a viable alternative energy source emerging in that time scale (50 years) are high. But that does not solve the problems of the immediate future: - the severity of floods and droughts are increasing now, we need solutions that can be implemented immediately.

Soil carbon is receiving wide spread interest on a global scale for two reasons. Firstly it appears to be the most practical way of controlling net emissions and secondly it increases the ability to grow crops in the expected increase in flood and drought cycles.

Practical experience indicates that using wicking beds to increase soil carbon could provide an immediate solution. While the early thinking on wicking beds was simply to grow crops in drought conditions later thinking has realised the benefits of capturing carbon and focused on ways of maximising carbon absorption, particularly by using external sources which dramatically increase the rate of absorbing carbon.

Wicking beds provide a double protection. They can sequester large amount of carbon, they also provide some protection against floods and droughts. They cannot mitigate against the extreme conditions, as occurred in some parts of Australia, twelve years with no rain followed by devastating floods which dumped cars, fridges and even houses in the middle of agricultural land. But they can make better use of what water there is during a droughts and provide drainage in minor floods and help dissipate water after extreme flooding.

### **Obtaining international recognition**

While wicking beds have significant potential in the fight against climate change, the question is how to bring this technology to the global negotiations for serious consideration.

This is a two-step process. The first is to demonstrate by controlled scientific experiments conducted by a reputable scientific organisation that wicking beds have the potential to remove the tens of billions of tonnes of carbon dioxide we are currently emitting. Once this is achieved it is reasonable to expect support for the second more difficult task of developing a practical monitoring and global trading system.

The system needs to be global as many developed countries do not have sufficient land area to absorb all their emissions. They could readily trade carbon with developing countries with significant land areas in Asia, Africa, South America, Russia etc. who could adopt the wicking bed technologies financed in part by the carbon trade.

### **Strategies for adopting soil carbon**

Some countries (particularly Australia) and the UN have been struggling with how to adopt soil carbon as a climate change strategy. They however face the problems of measurement and how to handle the volatility of soil carbon.

Both the UN and Australia have adopted a strategy of not specifying a particular approach but inviting organisations to submit a methodology. This is then reviewed by experts in the field and if approved can they be adopted as a formal system.

This allows great flexibility for innovators to promote new systems for acceptance.

### **Roles of China and Australia**

Australia is a large country with old and depleted soil and erratic rainfall. Adopting European farming practices in the early stages of agriculture resulted in wide spread damage to the fragile soil. This has created an acute awareness throughout the community of the dangers of soil degradation and the role of carbon in regenerating soils.

Practical farmers have pioneered many soil conservation techniques which are widely adopted. The adoption of no till farming is probably the highest in the world. Specialist machinery manufactures have developed no till and stubble braking machinery which is sold around the world.

Pioneers such as Louisa and Michael Kiely founders of the Carbon Farmers of Australia have done pioneering work in promoting carbon farming and forming the Carbon Farmers Coalition , while Christine Jones has been an early pioneer and free thinker on soil carbon and carbon trading.

These practical pioneers have been highly entrepreneurial in developing innovative technology ahead of the scientific community.

Governments, both Federal and States have invested heavily into research into soil carbon and monitoring technology.

However Australia's current prosperity is due in large part to its exports of coal, iron and other mining products largely to China. This has created powerful vested interests groups who have given strong opposition to the Governments desire to take strong action on climate change, for example by introducing carbon trading schemes. The Government has continued to struggle to introduce such schemes and looks like eventually succeeding. The population as a whole is supportive of strong action on climate change but possibly less supportive of the specific schemes which inevitably are a political compromise to get through our current hung parliament.

However Australia has a small population and minor political clout in the International scene. The Government has therefore refrained from pushing the larger reforms which are needed on the international scene and in its legislation followed a strategy of strict adherence to the Kyoto protocol. Australia has not made major incursions into changing the International scene on climate change.

There are major differences and similarities between China and Australia.

China shares with Australia a variable climate subject to floods and droughts. With a large population to feed it has strong motivation to protect its agriculture from the worse effects of climate change. China has also demonstrated an ability to adopt and develop technology which has amazed the rest of the world.

However the major difference between China and Australia is the political clout of China on the International scene. China is obviously important in its own right but also acts a leader for the developing world. If China were to adopt a particularly strategy on carbon the political reality is that other countries would follow suit.

## China and Kyoto

China is not a signatory to the Kyoto protocol. There are very good reasons why China should not sign. The Kyoto protocol focused on a % reduction from 1990 levels for developed countries and in 1990 China was nowhere near the economic power house it is today. China as a rapidly growing economy would find it difficult to reduce emissions without severely affecting the spread of the benefits of technology to its less affluent population.

The whole concept of a reduction of emissions based on a % of current level is simply false for China. Many features of Chinese society are intrinsically low emission. Contrast the design of cities with typical Western cities. In China most of the services are available locally; there is simply no need for mass movement of the population, shops, parks, work, entertainment etc. can be reached by walking or by a local bus. Contrast this with a Western city where the bulk of the population live in suburbs. Work, shops and entertainment are typically some distance from home and the only way people can access them is by car, as public transport is limited. This is intrinsically greenhouse intensive.

Another example is the high speed rail network which must be one of the most extensive in the world. This is greenhouse effective compared with the Western alternative of cars and planes.

If China is already greenhouse effective it is inequitable to impose a % reduction when there is a large rapidly advancing population. This makes no sense and is a direct result of the principle of 'additionality' built into the Kyoto protocol which actually punishes countries who are already carbon efficient.

What is important and should be the basis for future agreements is the absolute level of carbon emission.

Let us examine what would happen if China became carbon neutral by adopting soil carbon. On the principle of submission adopted by the UN and Australia all China need do is prescribe the procedures used to absorb carbon and present scientific evidence of validity.

China is the world's largest emitter; - the US is second. The US refuses to sign the Kyoto protocol, largely under the influence of the climate change sceptics, on the grounds that China, the largest emitter is not a signatory.

If China had been able to achieve carbon balance (or even just reduce net carbon emissions) by adopting soil carbon (backed by scientific evidence) the US could not use that argument. Developing countries would follow the Chinese making a global agreement easier to achieve.

China is reported to be introducing a carbon trading scheme but at this moment no details are available (in the English literature).

## **New philosophy for soil carbon and wicking beds**

Traditional (Kyoto based) schemes for soil carbon are based on the schemes developed for forestation.

But soil carbon is fundamentally different as it is dynamic with carbon continuously entering and leaving the soil. This needs to be recognised and the accounting should be based on the carbon in the soil at any particular point in time.

This does need a modification of the accounting methods for soil carbon which will inevitably vary with time. For example at the start of a carbon harvesting programme large amounts of carbon may be captured in the soil, this may increase significantly in subsequent wet periods but may actually fall in dry periods.

So how do we trade carbon when say 100 tonnes may be harvested in year 1, rising to 120 in year 2, then fall to 85 in year 3 and then rise again to 130 tonnes in year 4.

What happens if a piece of farmland is taken over for say building flats so the soil carbon may be lost? In a sensible world the fertile top soil would be recovered and taken to another site for further use for food production. How is this accounted for in carbon trading?

There is yet another problem in developing a scheme for carbon trading, namely the large number of farms, which in the Kyoto based system would require measuring carbon at every farm. This would become prohibitively expensive.

The solution to all these difficulties lies in what is being called in Australia, the 'Deeming principle' and which is becoming rapidly accepted. Deeming was the founder of modern quality control who shifted the philosophy of measuring every single item produced by a process to monitoring the process. If the process was under control then it is assumed that the individual items are OK.

While this philosophy was initially developed for the manufacturing industry it is equally applicable to agriculture.

What this means in practice for soil carbon is that individual farmers would be paid a set amount of money for following a defined process. It does not really matter about the individual soil type or climate he just gets paid a flat fee for providing a service.

The only way that we are going to absorb the ten billion tonnes or so of carbon we are emitting each year is to get as many farmers to participate as possible. The Deeming approach provides a simple and rugged system which is attractive to farmers and which they can readily adopt.

## **Role of aggregators**

In practice the farmer would be paid by an aggregator who looks after many farms. In China this could be a public entity like a local Government or Institute or a private organisation.

In the case of the wicking bed the farmer would report the amount of organic material which is being incorporated into his land. The aggregator would be conducting ongoing research measuring the relationship between organic material incorporated into the soil, the current carbon content and the rate of decomposition and release of greenhouse gases to the atmosphere.

This would give a figure for the current (and predicted future) carbon content of the soil which can then be used for carbon trading.

The aggregator does not pay the full amount of money received to the farmer but holds a certain amount back to cover both the costs of measurement and also to provide a type of insurance service for the farmer. If the carbon content happens to temporarily drop or if his land is taken over for say building the loss of carbon is covered by the insurance.

The importance of protecting the farmer from future eventualities cannot be overemphasized. Consider the situation where a farmer is paid say \$20 a tonne for the carbon he captures but in the middle of a drought when economic conditions are tough he finds he is liable to pay back carbon at say \$200 a tonne. Such dramatic rises in carbon price are expected as carbon trading develops.

This process is of great importance to making the scheme work, it provides a stable revenue stream for the farmer who is never placed in the awkward situation of having to pay back money for carbon if his land is taken over or there is a prolonged drought. The purchaser of carbon credits is equally assured that he is buying a reliable and fixed amount of carbon credits.

In practice the aggregator would never need to pay back any carbon credits, these would be covered by new carbon credits or from the carbon bank.

## **Conclusion**

The three key steps in establishing the wicking bed technology are;-

- 1) Confirm by independent scientific measurement the improvement in water use efficiency and productivity of the system
- 2) To measure the amount of carbon stored in the soil and the rate of loss over time. (This would use the methods of logarithmic decay or half-life or some other methods of extrapolation)
- 3) Develop a methodology for carbon trading which can be submitted to the appropriate authorities in China, Australia and the UN.

