What future for agricultural emissions trading and offsetting?

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Introduction

I used my fellowship to explore the role of agriculture in greenhouse gas emissions off - setting and trading schemes with reference to the situation in California, which has been one of the most progressive US states in terms of developing frameworks for managing emissions including those from the agricultural sector. The state has recently adopted a Bill that sets in place one of the most proactive cap and trade schemes in the world, and I wanted to consider whether or how this will eventually encompass larger agricultural emissions sources. The California experience is slightly ahead of the European situation (the EU emissions trading scheme ETS), by allowing regulated industries (those inside the scheme) to comply with their emissions limits by buying offsets from industries outside the scheme. While agriculture is outside the California cap and trade scheme, it has been gearing up to offer accredited emissions reductions to regulated firms. The supply of these so-called voluntary emissions reductions is an emerging business opportunity for agriculture, and I wanted to understand the conditions for growth in the voluntary emissions market. Because of the growing failure to meet global emissions targets, the overall direction of travel with climate change policy is towards more stringent emissions regulation covering all sectors. While agriculture may be exempted longer than most industries, offsetting is potentially an opportunity for agriculture to counterbalance some emerging threats.

The institutions I visited during the study period are listed in Annex 1

Climate change mitigation

Climate change is now recognised as an inevitable phenomenon, with largely incontrovertible scientific evidence showing the links between atmospheric greenhouse gas concentrations and global climatic variability. As in other industries, agriculture can respond by adapting to these potential changes or by contributing to the solution of the problem by reducing (mitigating) emissions. Current scientific uncertainties preclude the accurate prediction of climate variability (including extreme heat events, variable rainfall), so adaptation responses are largely being left to farmers themselves as so-called “autonomous” decisions. In some countries including the UK, government advice on the inevitability of some adaptation is slowly being developed[2].

In contrast, the need to reduce emissions has spurred more government action largely within the international framework of the United Nations Framework Convention on Climate Change (UNFCCC), which has been working for more than three decades to stabilities emissions trajectories. Under the scientific guidance of the IPCC, many signatory countries have accepted largely externally determined cuts in their allowable emissions to be delivered by key deadlines over the next 2 decades. These targets are challenging and the UNFCCC process has been a difficult exercise, with schisms opening between developed and developing parties, and doubt periodically being cast over the underlying scientific evidence being delivered by the panel. Overall, every aspect of the process has been politicised, which is unsurprising, given the economic and ethical stakes.

[22] For example the Climate Change Research Assessment being finalised by Defra includes a module examining the status and needs in agriculture

Government response

As a signatory to international agreement on emissions reductions, a country like the UK[3] has to determine how to share out the implied commitment in a rational way. There are many big and small emitters in all sectors of the economy and government can choose to regulate them all in a blanket fashion, or it can choose to target the largest and most identifiable sources. Such direct regulation is often unpopular because different industries face different costs in dealing with the problem. In truth the correct response is to identify the polluters that face the lowest costs mitigation and to have them reduce their emissions first. In this way, the necessary reductions happen more systematically with the cheapest first. The problem here is that government cannot easily peer into each industry to audit the true costs, and no industry has the incentive to reveal its costs and they fall into the trap of being picked first.

In a more intelligent solution to this cost-based regulation, economists have therefore suggested to flush out this cost information using a market-base approach to the problem. In this case a market for pollution permits could help to reveal the cheapest mitigation options within the economy. Under such a market, every polluter would be required to audit their own emissions and submit a claim for corresponding permits to continue emitting[4]. The sum total of permits claimed and then allocated would become the so-called cap on the system. Those subsequently holding the permits could then sit on them as a cost of doing business. If it turned out to be cheaper for them to reduce units of emissions than the cost of permits, then they could eventually sell permits to industries finding it more difficult to cut emissions.

The elegance of the cap and trade systems is well-documented in literature on market-based instruments for pollution control. In reality, there have been many teething problems in the existing schemes, especially the earliest example, the EU Emissions Trading Scheme, which saw much volatility in permit prices, which has continued during the current economic recession. This is not surprising, since companies often react to economic downturn by selling off their assets. In general, there is widespread recognition of the merits of cap and trade schemes to solve the intractable problem of managing emissions. Figure 1 shows the general spread of schemes, including the Californian scheme, which is the subject of this report. But other schemes have emerged, each with different rules about how permits are allocated and which industries are included and whether non-participating industries can be used as sources of cheap offsets (see below). Major schemes are in Australia and New Zealand, Korea; and most recently, an announced pilot in seven provinces in China. The latter scheme is potentially the most interesting, since success in China could be a major turning-point in the management of global emissions. Ultimately, the accession of a large polluter like China into a cap and trade arrangement, could be the first building block in a global market for pollution permits and hence the emergence of a global carbon (permit) price. This represents the nirvana of the political economy of addressing the global problem of greenhouse gas emissions. In other words, imagine a world where all industries must hold permits and where no sector can opt out to gain some unfair cost advantage by not paying for emissions permits. For many businesses, this represents a truly level playing field which we do not have unless larger emitting countries participate in schemes.

The problem and agriculture's role

[3] Though interestingly, not the US, which opted out of key targets set at Kyoto while being a party to the UNFCCC

[4] In truth, this "claim" could take place through an auction. But more commonly governments have made a free initial allocation to industries based on historical emissions.

Agriculture is a significant source of greenhouse gas emissions. Current inventory figures used in formal reporting suggest that – taking a broad definition - agriculture accounts in total for approximately 8% of total UK emissions[5], expressed as carbon dioxide equivalents (CO2e). Within this, agriculture contributes less than 1/5 of total carbon dioxide (CO2) but over 3/4 of all nitrous oxide (N2O) and 1/2 of all methane (CH4) emissions.

Agricultural emissions arise mostly as CO2 from the conversion of land to cropping (nearly 1/2 of total agricultural emissions), N2O from the application of fertiliser and manure to soils (1/4), and CH4 from enteric fermentation in ruminant digestion (1/5). Against this, agriculture also represents a GHG sink, with sufficient CO2 being sequestered by crop and grassland to offset agricultural emissions.

These proportions vary across countries and regions, but what makes agriculture different is the fact that this variability is affected by climatic and management decisions across a myriad of small producers, which are difficult to monitor and regulate accurately. Government decisions and the use of market-based approaches are thus more challenging relative to industries where emissions are easy to monitor and where technical solutions are relatively well understood in terms of effectiveness and cost.

These uncertainties mean that the agricultural sector has been slow and somewhat reluctant to engage in the issue of emissions accounting and responsibility; regarding the area as a business threat rather than an opportunity. Citing the issues of food security and economic conditions, industry bodies in many countries have lobbied successfully to remain outside formal targets or management instruments like the cap and trade. In response, governments have developed largely voluntary approaches to the co-management of agricultural emissions. This includes improvement of emissions inventories, development of farm advice, and the development of analysis to illustrate cost-effective mitigation options in the sector.

Cap and trade and agriculture

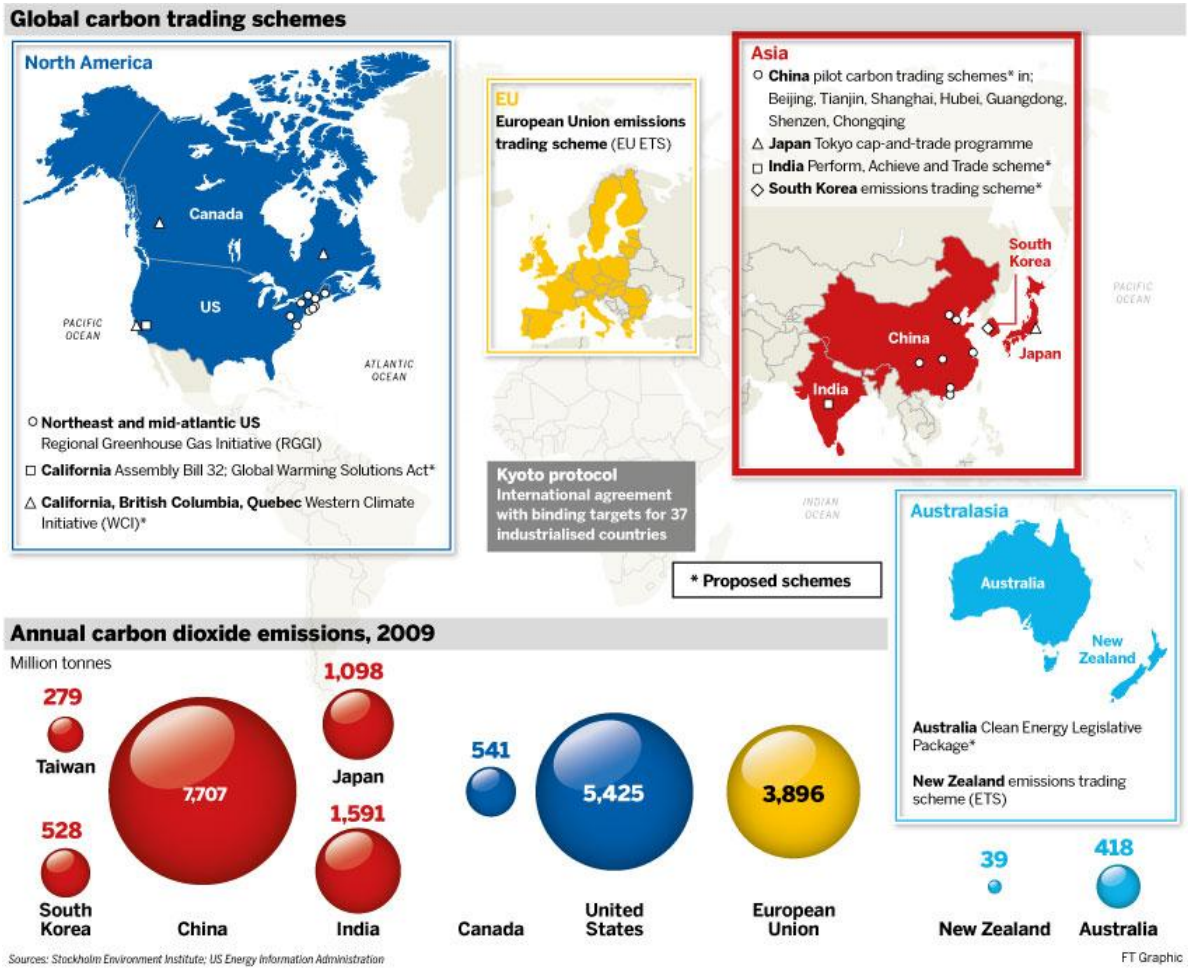
In Europe agriculture is not part of the initially ETS phase, which is nominally designed to accommodate large single point-source emitters. In contrast, agriculture is perceived to be more difficult to control, being made up of a large cross-section that includes many small and medium sized producers that would be costly to police in terms of compliance with trading rules. Largely because of its structure there is also no formal requirement for the sector to reduce emissions. But this situation is becoming more conspicuous as governments seek to harness low-cost emissions from all sectors. Such reductions are known to exist in agriculture and there is recognition that farmers require more information on how these can be made from improving basic practices such as nitrogen use and slurry storage. So far, the UK government has opted for voluntary engagement with the sector in terms of agreed target setting for reductions[6]. These targets have been partly determined using analysis by SAC for the UK Committee on Climate Change, which is an independent authority set up under the last government to set budgets for each sector of the economy. This analysis has highlighted some of the win-win potential inherent in implementing some farm measures such as fertiliser management. That is, farmers could actually save money on inputs as well

[5] Global estimates of agriculture's contribution range from 18% to a more improbable 51%. This discrepancy relates to how much global land use change and deforestation one attributes to agriculture; see http://bittman.blogs.nytimes.com/2012/07/11/fao-yields-to-meat-industry-pressure-on-climate-change/

[6] See for example the UK Agricultural Industry Greenhouse Gas Action Plan www.agindustries.org.uk/documents/crossSector/GHGAP_Delivery_Plan__04_April_2011.pdf

as reducing emissions. The advantages of other (albeit positive cost) measures such as anaerobic digestion of waste for energy have also been highlighted.

Figure 1 Global emissions trading schemes



If the voluntary approach is ultimately unsuccessful, government is ultimately likely to consider other forms of indirect and direct regulation. In the UK the former is most likely via EU Rural Development Policy measures to pay farmers for specific emissions reduction measures. A range of measures covering animals, crops and soils can be targeted for this form of cross-compliance. However, given the voluntary nature of these policies, there is no certainty in terms of meeting target outcomes. In the longer term it is possible to envisage more punitive measures for emissions control.

But what of the ETS or other forms of valuable emissions credits? Might it be possible for some farmers to turn a profit from voluntary emissions reductions and selling credits for these to industries outside who find it more costly to comply with their obligations? Under current ETS rules agricultural credits have no formal entry point to the ETS. But outside the scheme there is a nascent voluntary credit and offset market, which in theory is open to anyone who can offer valid emissions reductions to anyone who wants to buy them. But the question of what constitutes a valid reduction is a crucial sticking point. Questions about accreditation and additionality of these voluntary credits means that farmers are not really

willing to undertake early action that may later be overtaken by mandatory requirements[7]. It is my observation that this situation is essentially retarding the emergence of a credit market that I observe to be developing in the US and in California in particular. I was therefore interested to explore the current development of the market with selected stakeholders.

California Cap and Trade

It is well known that California shows the future. The state tends to be at the vanguard of technological and economic change, and where it goes the rest of the world sooner or later follows. Surprisingly perhaps for the US, this applies to the management of greenhouse gas emissions. Hence my choice of California to gauge the latest developments in emissions trading, with a special focus on the agricultural sector.

In 2006, the California legislature passed and Governor Schwarzenegger signed AB 32, the Global Warming Solutions Act of 2006, which set an ambitious 2020 greenhouse gas emissions reduction goal into law. It directed the California Air Resources Board (ARB or Board) to begin developing discrete early actions to reduce greenhouse gases while also preparing a scoping plan to identify how best to reach the 2020 limit. The reduction measures to meet the 2020 target were adopted by the start of 2011. The ARB Identified the state-wide level of greenhouse gas emissions in 1990 to serve as the emissions limit to be achieved by 2020 (HSC §38550). In December 2007, the Board approved the 2020 emission limit of 427 million metric tons of carbon dioxide equivalent (MMTCO2E) of greenhouse gases.

AB 32 included regulation requiring the mandatory reporting of greenhouse gas emissions (HSC §38530). In December 2007, the Board adopted a regulation requiring the largest industrial sources to report and verify their greenhouse gas emissions. The reporting regulation serves as a solid foundation to determine greenhouse gas emissions and track future changes in emission levels.

Notably, AB 32 included a regulation that establishes a system of market-based declining annual aggregate emission limits for sources or categories of sources that emit greenhouse gas emissions, applicable from January 1, 2012, to December 31, 2020. In 2011, the Board adopted the cap-and-trade regulation. The cap-and-trade program covers major sources of GHG emissions in the State such as refineries, power plants, industrial facilities, and transportation fuels. The cap-and-trade program includes an enforceable emissions cap that will decline over time. The State will distribute allowances, which are tradable permits, equal to the emissions allowed under the cap. Sources under the cap will need to surrender allowances and offsets equal to their emissions at the end of each compliance period. It is the nature of the offset arrangements that are potentially significant for sectors outside the cap and trade regulation but offering relatively low-cost emissions mitigation options (e.g. agriculture)

Emissions offsetting

At the time the cap was fixed in 2007, agricultural activities contributed approximately seven percent to total emissions in California, half of the emissions occur as nitrous oxide (N2O), the most potent GHG; the remaining half dominated by methane and a small amount of direct carbon dioxide emission from farm machinery. Recent research in many countries has demonstrated that agriculture offers cost-effective emissions mitigation potential, meaning that it may be cheaper to reduce emissions in this sector rather than in other more

[7] With the implication that early action is either not recognised or is considered non additional to what would have been done in any case as a so-called baseline action.

costly sectors with fewer mitigation options. Alternatively, the ability for agriculture to sell offsets allows lower cost compliance for purchasing industries.

ARB offset credits are greenhouse gas (GHG) emission reductions or sequestered carbon that meet regulatory criteria and may be used by an entity to meet up to eight percent of its triennial compliance obligation under the cap-and-trade program. Each ARB offset credit is equal to 1 metric ton of carbon dioxide equivalent (MTCO2e) and can only be quantified using an ARB approved compliance offset protocol

Subarticle 13 of the cap-and-trade regulation details the legal requirements for compliance offset protocols, implementation and verification of offset projects, and issuance of ARB offset credits. Once an ARB offset credit is issued, it may be used for compliance up to applicable limits with the cap-and-trade program.

In order for agriculture to provide solutions to address AB 32, it must either sequester GHG out of the atmosphere into a sink or reduce their emission to the atmosphere. As noted, there is a variety of methods to do this using improved crop and animal science. During this visit, I was particularly interested to see how emissions credit accreditation was working generally, and more specifically how this allowance under AB 32 might be fostering industrial development in the mitigation business 'space' and anaerobic digestion in particular.

Offsetting practice: protocols & registries

Subarticle 13 of the cap-and-trade regulation details the legal requirements for compliance offset protocols, implementation and verification of offset projects, and issuance of ARB offset credits. Once an ARB offset credit is issued, it may be used for compliance up to applicable limits with the cap-and-trade program. Only ARB can issue compliance offset credits and to this end it has sanctioned the activities of approved bodies to act as registries that can verify and accredit proposed offsets using specific protocols to standardise quality – in particular their additionality and permanence of the emissions reduction

Approved Offset Project Registries help administer parts of the Compliance Offset Program. These Offset Project Registries must meet specific regulatory criteria to be approved under the regulation. Offset Project Registries help facilitate the listing, reporting, and verification of offset projects developed using the compliance offset protocols. Registry offset credits cannot be used for compliance with the cap-and-trade program. Registry offsets must be converted to ARB offset credits to be eligible for use in the cap-and-trade program.

Climate Action Reserve (CAR)

Globally, a thriving though sometimes controversial market in voluntary emissions offsets has been brought into existence by legislation on country-to-country (principally developed and developing country) deals under the auspices of the Clean Development Mechanism[8] (CDM), which was originally part of the Kyoto Protocol. The aim here was to enable developed countries to meet part of their mitigation target using lower cost mitigation options available in developing countries that are in turn looking for development finance. Many teething problems about the veracity and quality of offsets have been addressed in this context.

Activity in US offsets began prior to 2007 in anticipation of the regulatory arrangement under AB 32. Indeed, some small, often not-for-profit organisations saw a role in terms of defining protocols for offsets and for brokering the arrangements between suppliers (e.g. farmers), buyers (e.g. energy utilities). Beyond this demand-supply relationship some organisations also got involved in bringing relevant technologies to market, such that developers (of said technologies) could negotiate a share of the revenues deriving from offset arrangements.

[8] http://en.wikipedia.org/wiki/Clean_Development_Mechanism

Other bodies have developed to fulfil the monitoring and verification of offsets and associated technologies. All in all, the existence of ambitious cap and trade regulation provides the incentive for considerable market development, showing that regulations offer opportunities as well as being perceived as threats.

During my study period, I visited Climate Action Reserve in Los Angeles, to discuss their role as a pioneer registry and to understand their role in developing protocols for agricultural offsets.

The Climate Action Reserve is a national offsets program focused on ensuring environmental integrity of GHG emissions reduction projects to create and support financial and environmental value in the U.S. carbon market. It does this by establishing high-quality standards for quantifying and verifying GHG emissions reduction projects, overseeing independent third party verification bodies, issuing carbon credits generated from such projects and tracking the credits over time on a transparent, publicly-accessible system. These standards not only ensure the environmental integrity of using offsets, but they also bring credibility and efficiencies to the carbon market by creating a trusted and valuable commodity.

The Climate Action Reserve's GHG emissions reduction project protocols provide regulatory-quality guidelines for project development and the quantification of carbon offset credits, known as Climate Reserve Tonnes (CRT). They are developed through a rigorous, transparent process that involves participation from stakeholders representing a variety of sectors, including industry, government, science, academic, public and environment. The protocols are widely regarded as among the highest quality standards for carbon reduction projects.

At the time of writing, the CAR had developed protocols of mitigation anaerobic digestion for livestock waste management, and for forestry. Work is on-going to develop protocols for rice cultivation and for nitrogen management. In developing these protocols CAR stress the need for measures that are applicable at scale, even allowing for the broad heterogeneity that can be encountered in farming systems. They also stressed interest in prioritising protocols for mitigation measures that deliver co-benefits – e.g. other positive environmental impacts. Interestingly, CAR will also accept to verify and endorse protocols developed by third parties. So, for example, a developer for a certain new technology that can facilitate some form of agricultural emission reduction has an interest in forwarding the process of protocol development that affects the market prospects of his/her technology. Non governmental (environmental) organisations (NGOs) have also been motivated to propose protocols where they can see emissions reduction potential.

Adherence to the Climate Action Reserve's standards (either their own protocols or those they endorse) ensures emissions reductions associated with projects are real, permanent and additional. The Climate Action Reserve only registers projects that have been independently verified as adhering to its project protocols. It also assigns unique serial numbers to all generated carbon credits. This prevents the possibility of double counting and assures buyers that when a CRT has been retired; it cannot be sold or transferred again and has created a real and permanent offset. All project information is made publicly available through the Climate Action Reserve system.

Industry reports indicate the market price for CRTs ranks in the top tier among carbon credits. CRTs can be traded in the voluntary carbon market or transferred into the Voluntary Carbon Standard's unit of measurement, the Voluntary Carbon Unit (VCU).

Examples of biodigestion (anaerobic digestion AD) plants

Prior to my trip to the US I had made contact with farmers that I identified through the CAR project list or a registered on the USDA AgSTAR program, which was created in 1993 by EPA - in cooperation with USDA – and is a voluntary effort of EPA to advance the capture and use of biogas from livestock manure. I was interested to see whether producers on the latter group were motivated by the possibility of offsetting opportunities.

USDA helps promote renewable energy generation and resource conservation by providing technical assistance, financial support and standards development to US farmers. USDA, primarily through Rural Development and Natural Resources Conservation Service, has provided grants, loans, and loan guarantees to eligible recipients for renewable energy systems and energy efficiency improvements and technical support to farmers on resource conservation and protection. Recent support for digester systems has primarily been through the Rural Energy for America Program, Environmental Quality Incentives Program, Value-Added Producer Grants, and EQIP-Conservation Innovation Grants. Farmers I spoke with suggested that these grants have tended to be over-subscribed.

The following dairies were contacted, although timing only allowed visits to the first three.

Stockdale dairy, Bakersfield, Kern County (CAR)

Old River Road dairy, Kern County (CAR)

El Mirage dairy , San Bernardino County (AgSTAR)

Bullfrog Farms, Imperial County (CAR)

Each dairy had different characteristics and was engaging differently with market-based incentives including those described above in relation to the cap and trade scheme. Stockdale dairy and Old River Dairy were owned by the same proprietor (John Bidart) who has been active in the development of biogas options. Having installed capacity in the Stockdale dairy he was now waiting to see how the plant performed before committing to similar investment in the Old River Road dairy. Although had been actively exploring the economics of biogas plant, his interest was spurred on by an approach from an intermediary company Calbioenergy, who had approached him offering a specific novel arrangement to actually build, own and operate the plant (see below). They also helped identify the appropriate technology and to negotiate the process of protocol compliance with CAR. Calbioenergy (located on the east coast) proved to be an interesting intermediary of the type referred to previously. In essence they broker arrangements with emissions sources outside the regulated sector in order to split the proceeds from the sale and transaction of offsets.

John Bidart was generally positive about the longer term prospects for bioenergy stimulation by AB 32 regulation. However, he painted a more troubled history of how available AD technologies were being retarded by a combination of unforeseen factors. Initially the available technology had been held up by compliance with other air quality regulations. Once these had been surmounted, it was clear that the profitability of the plant depended not only on the sophistication of the specific technology, but on three other factors; namely the price paid for offsets (in effect the carbon price), the price of natural gas as an alternative source of power generation, which in turn affects the feed in tariff paid by the power utility for energy supplied to the electricity grid (in this case Pacific Gas & Electricity). Recent market conditions had conspired to make all these variables more uncertain and this was not attractive to farms like Bidart.

In a bid to remove some of this uncertainty, Calbioenergy have been lobbying PG&E to extend their green tariffs to customers as a means to keeping all sources of renewable energy in their mix. But this was being made more difficult by falling gas prices and low cost wind energy generation technologies. Both factors make any commitment to AD sources less attractive to energy suppliers.

Given these uncertainties, methods to reduce this risk of investing in AD capacity are therefore attractive to market participants. John Bidart explained that the agreement with Calbioenergy was based on a build, own and operate deal, with Calbioenergy building and owning the majority share of the plant. Bidart himself negotiates a profit share in the tariff revenues mentioned above. The agreement also allows him to take an increasing equity share in the plant at a later date.

Experience at El Mirage dairy pre dated much of the drivers provided by the cap and trade policy. I was interested to clarify the incentive for the plant installation and whether the plant was participating in current off set arrangements. Anita Imsand explained that the dairy had pioneered various forms of AD plant innovation primarily as a means to develop energy self sufficiency, which they had achieved. Interestingly however, their initiative had not anticipated the emergence of guidelines on voluntary offsets and the need to demonstrate additionality relative to a business as usual action. In forging ahead with their installation, the Imsand's have effectively found it difficult to comply with credit rules since the installation could not be considered to be delivering additional mitigation. Despite this, the plant had delivered on its energy objectives and was considered successful for other non energy reasons. These included the more efficient handling of waste (reduction in flies) and the generation of solid digestate as a soil additive.

Comments and conclusions

Existing research is showing that agriculture can offer relatively cost-effective emissions mitigation, but the incentives for exploiting this potential are currently patchy in different countries, and the UK does not offer a regulatory framework for this activity to grow. The California experience is not as advanced as I had supposed; market conditions in terms of low alternative energy costs, low feed in tariffs and depressed carbon prices have dampened the demand for such offsets. But the eligibility of offsets is established in legislation and agricultural biogas offers considerable verifiable potential once market conditions improve. This is bound to be the case as emissions reduction requirements become more stringent in future.

The most interesting observation from my trip is the way in which emissions regulation can spur a whole industry around both the technology (in this gas biogas plant) and the monitoring and verification of emissions reductions. The offset market represents a business opportunity that is currently under-developed in the UK. Current voluntary emissions policy does not provide a similar market stimulus that comes from mandatory regulatory compliance. Indeed a combination of policy uncertainties (i.e. the future of the CAP and emissions control policy), are retraining decisions in favour of early mitigation investments.

As the ETS develops in later phases, the role of agricultural emissions will come under more scrutiny for their potential contribution either within formal emissions trading or outside the ETS as a viable source of offsets for other regulated industries. There are currently few if any companies offering emissions verification and registry services in the UK and this represents a business opportunity that is set to grow.

Figure 2 Bio digester generator Stockdale Road dairy

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Peters- Stanley et al (2012) Developing Dimension State of the Voluntary Carbon Markets 2012; http://www.forest-trends.org/publication_details.php?publicationID=3164:

http://www.climateactionreserve.org/

Annex 1 contacts and activities during US visit

Visit period 18th – 31 May.

Climate Action Reserve, Los Angeles, Scott Hernandez

Stockdale dairy, Bakersfield, Kern County, John Bidart

Old River road dairy, Kern County, John Bidart

El Mirage dairy , San Bernardino County, Eddie & Anita Imsand

University of California Santa Barbara, Charles Kolstad

University of California Davis, Neil MacRoberts ,

University of Arizona (Tucson), Adaptation Futures conference - paper presented on the evaluation of livestock (climate change) adaptation measures. NB – conference fee was not paid by travel award. The conference was a good opportunity to present previous work (undertaken for Defra) and to interact with researchers working on agricultural adaptation more generally