

**AN IRISH NUFFIELD FARMING
SCHOLARSHIPS AWARD**

**BIOENERGY. EMPOWERING FARMERS
IN A GLOBALISED ECONOMY**

Geoff Dooley

January 2005



**NUFFIELD
FARMING
SCHOLARSHIPS
TRUST**

NUFFIELD FARMING SCHOLARSHIPS TRUST

Nuffield travel Awards give a unique opportunity to stand back from your day to day occupation and to study a subject of interest to you. You do not need any academic qualifications, but you will need to persuade the Selection Committee that you have the qualities to make the best use of an opportunity that is given to only a few.

Awards are open to you if you work in farming, growing, forestry, or otherwise in the countryside and sometimes to those working in ancillary industries, or who are in a position to influence those who do and you are resident in the UK. The normal age range is 25 to 45, but at least one younger candidate will receive an Award. However, you must have spent at least two years working in the industry in the UK. Pre and post graduate students are not eligible for an Award to support their studies.

Full details of all the Awards will be sent to applicants. Please write, or telephone to John Stones, Director, NFST, Blaston Lodge Farm, Blaston, Market Harborough, Leicestershire, LE16 8DB. Tel: 01858 555544 or e-mail Nuffielldirector@aol.com Website: <http://www.nuffieldscholar.org>

Closing date for completed applications is the 7th January each year.

Copyright © Nuffield Farming Scholarships Trust
ISBN 1 904570-48-8

Published by Nuffield Farming Scholarships Trust,
Blaston Lodge Farm, Blaston, Market Harborough, Leicestershire LE16 8DB

Registered with the Charity Commissioners No. 1098519

Nuffield Farming Scholarships Trust

is grateful for
the assistance given
by

Banks Cargill Agriculture Ltd

in the publication
of this
report



Banks Cargill
Agriculture

Witham St Hughes
Lincoln
LN6 9TN

An Irish Nuffield Farming Scholarships Award

Bioenergy.

Empowering Farmers in a Globalised Economy.

By Geoff Dooley, 2004

The Irish Cooperative Organisation Society Award

Contents

Executive Summary	page 4
Introduction	page 7
The Study	page 9
Ireland	page 9
Denmark	page 10
The University of Southern Denmark	page
11 Green Farm Energy, Lojstrup	page 11
Thorso Biogas Plant	page 12
Brussels	page 13
Aebiom	page 13
COPA-COGECA	page 14
The World wide Fund for Nature	page 14
The United States of America	page 16
Minnesotan Department of Agriculture	page 16
Corn-er Stone, Luverne	page 17
Al-Corn, Claremont	page 18
Adkins Energy, Illinois	page 19
Haubenschild's Anaerobic Digester	page 20
Bioenergy and Environmental, Illinois	page 21
Bixby Biomass Pellets	page 22
The Institute for Local Self-Reliance	page 22
Monsanto, St. Louis	page 24
Iogen Corporation and Purevision Technology	page 25
University of Columbia, New Generation Co-operatives	page 25

University of Florida	page 27
A Duda & Sons, Inc., Oviedo	page 28
International Carbon Bank and Exchange, Gainesville	page 29
Switzerland, The WTO	page 29
Conclusion	page 31
Recommendations	page 35
Disclaimer	page 36
Acknowledgements	page 36

Executive Summary

The question of how farmers can adjust to changing external conditions is at the heart of this study. Answers were sought by examining the potential for broadening the scope of traditional farm enterprises, by including bioenergy production.

Bioenergy is multi-faceted. It encompasses utilising waste streams from exiting farm and forestry enterprises as an energy source and the cultivation of single purpose energy crops.

The Study

The study focuses on the factors which prompted farmers to become bioenergy producers, the methods used to organise bioenergy developments and assesses the affect that this diversification has had on both the farmers themselves and their communities. In so doing, it pays particular attention to the process of economic globalisation as a vector for changing farmers' production choices. It also considers some of the ongoing technological and social developments which are likely to be key influences in the future development of the bioenergy sector. The findings of the study are based on an examination of:

- The anaerobic digestion plants for manure management in Denmark and the United States.
- The ethanol biorefineries in the United States.
- The social and political structures impacting upon the development of bioenergy in the EU.
- Economic globalisation as epitomised by international free trade and the workings of the World Trade Organisation.

Advantages of Bioenergy

- It is a domestic source of energy. Ninety percent of Ireland's energy requirements are imported.
- There is strong local demand for energy. Therefore, producers are not dependant on finding export outlets.
- Bioenergy use would help Ireland to control its emissions of greenhouse gases which it is legally obliged to do as a signatory of the Kyoto Protocol on climate change.
- The raw materials for bioenergy can be the by-products from another enterprise. Therefore, bioenergy production can enable efficient waste management.
- Biomass fuels are made of solids. This means that energy can be stored and transported. It can also have multiple end uses.
- Biomass is everywhere. Bioenergy production is a potential enterprise for all farmers.

Bioenergy Drivers

In many circumstances the decision to opt for bioenergy production is made in response to external pressures, such as stricter regulations on waste management, or falling returns from traditional farm commodities. This observation prompted an emphasis on the issue of farmer empowerment, which it is argued has been undermined by:

- The industrialisation of agriculture, which has led to an increasing proportion of the monetary value of farm produce, being added outside the farm gate. As a result, the farmer's share of consumer spending on agricultural produce has dramatically declined.

- The gap in the production chain between the farmer and the consumer, being dominated by corporations, whose sole purpose, is to maximise returns to their shareholders.
- The flow of power upwards to supra-national institutions, such as the EU and the WTO, resulting in the diminished ability of national governments, to protect their farmer interests.
- The belief that, sacrifices on the part of European and North American farmers, will solve the problems of developing countries.

Evidence of bioenergy being chosen as a result of an internal choice to proactively broaden the scope of the farm business is sparser, though it was often a secondary consideration.

Obstacles to Bioenergy

- Bioenergy is difficult to define. Because of its multiple products and services no single agency or department has responsibility for it. This also results in it being under-valued.
- Bioenergy technology and systems are immature. Unproven technologies and the paucity of successful examples discourage investors.
- Fossil fuel and nuclear energy subsidies obstruct investment in bioenergy and undermine its competitiveness.
- Prevailing energy supply structures do not have a tradition and are not equipped to utilise a dispersed resource such as biomass.

Models for Bioenergy Development

The advanced technology and significant investment required by some bioenergy projects has given rise to the use of innovative organisational models. The study pays particular attention to the producer owned or new generation co-operative model upon which the majority of the ethanol bio-refineries in the US are based. Restricted membership and tradable shares, with raw material delivery rights/obligations attached, are their key features. They represent an attempt to 'vertically integrate' the relationship between the farmer and the consumer, thereby enabling the farmer to benefit directly from the value added to farm produce after it leaves the farm. As such, the new generation cooperatives are interpreted as an evolutionary adaptation that seeks to redress the shortcomings of traditional cooperatives in an industrialised agriculture, and not just as a response to the specific needs of ethanol production.

Bioenergy – the Future

- Developments in biotechnology are set to broaden the range of potential raw materials for bio-refineries thus increasing the scope for the production of higher value bioenergy and biochemical products from current agricultural waste streams and single purpose energy crops.
- Social and political pressure for a more sustainable and multi-functional agriculture can be translated into a higher market demand for bioenergy products and services.
- The accelerating globalisation of the world's economy will increase the exposure of traditional farm commodities to competitors. Continued price pressure is inevitable. Consequently the relative attractiveness of bioenergy is set to increase.
- Optimists suggest that oil scarcity will not be an issue for thirty years. Pessimists say ten years. In either case, the pressing need for the development of alternative energy sources bodes well for the future of bioenergy.

Conclusion

The industrialisation of agriculture and economic globalisation have revolutionised farming and the changes are set to continue. Some farmers will respond by further embracing the characteristics of industrial production such as mechanisation, specialisation, mass production and an emphasis on the service of export markets. For these farmers, bioenergy can add an important extra dimension to their business, particularly in the area of waste management and reducing the farm energy bill.

Other farmers will adapt to change by switching to a diversified portfolio of both products and services, which in particular, will be capable of satisfying local and national market demands. For these, bioenergy can become a core farm enterprise or a vehicle for the establishment of a farmer owned and community based business.

Recommendations

To create a robust bioenergy market, financial incentives should be used to boost demand for bioenergy based products. Options in this regard include:

- **Electricity price.** The price offered for electricity from biomass must reflect its true value to society.
- **Excise duty relief.** Taxes on bioenergy products should be reduced or eliminated. Revenue shortfalls should be compensated for by carbon taxes.
- **Capital grants for biomass burners.** The use of biomass as a heat source in domestic and commercial buildings needs to be encouraged.
- **Mandate bioenergy use.** Legally binding targets for the inclusion of bioenergy in the overall energy mix should be set for the short to near term.

To enable bioenergy producers to meet a rising demand, structural obstacles must be removed from the supply side. Action needs to be taken in the areas of:

- **Grid access.** Because of the dispersed nature of renewable resources the electricity grid must be made capable of accommodating multiple access points.
- **Streamline planning applications.** The development of the bioenergy sector is in the national interest. The planning process must establish unambiguous criteria, which if satisfied, automatically give bioenergy developers the right to proceed with projects.
- **Bioenergy at a 'single desk.'** The multi-characteristic nature of bioenergy, results in it falling into several 'pigeon-holes'. A 'single desk' needs to be created for bioenergy.

Bioenergy represents a wonderful opportunity for farmers to engage in value-added processing – an opportunity which they have failed to seize in other areas. Measures that would help farmers to grasp the opportunity before them include:

- **Making Technology affordable.** Companies and institutions that develop patented technologies using public money should be required to license these technologies to local based bioenergy developers on very reasonable terms.
- **Tradable carbon certificates for farmers.** Bioenergy developers should qualify for tradable carbon permits in recognition of the carbon emissions off-set as a result of their project.
- **Policy support for the development of new generation co-operatives.** The new co-ops have the potential to act as a countervailing force to the prevailing omnipotence of corporate dominated processors and retailers. A viable alternative model to that of the corporation would benefit, not just farmers, but all of society.

Introduction



Bioenergy is energy that is derived from biomass. It is the oldest fuel used by mankind. Wood has been used for cooking and heating for over 500,000 years. One hundred and fifty years ago clothes, houses, vehicles and chemicals were almost exclusively derived from plants. Only a couple of generations ago agricultural production spanned food, fuel and fibre, where the fuel was the oats to feed the horse, and the fibre was either flax from which linen was produced or sheep's wool.

Is it feasible, with the aid of modern technologies, to go "back to the future", and to recommence using plant materials for purposes other than food production? Furthermore, could a switch to producing non-traditional commodities that have a strong local demand release farmers from some of the competitive pressures which are undermining the profitability of export markets? These are a couple of the questions on which this scholarship is based.

My interest in bioenergy stems from a project I undertook while studying an environmental science module with the Open University. In the year 2000, the then Irish minister for the Environment, Mr Noel Dempsey, was quoted in the national press as saying that compliance with the Kyoto Protocol on climate change may necessitate a 10% reduction in the national livestock herd. Unsurprisingly, the suggestion was widely ridiculed. However as a dairy farmer, and as a student with an environmental science project deadline looming, I was interested.

I studied the link between cattle and climate change and discovered that individual animals can release up to 100 kilograms of methane per year, a gas which is calculated to have 21 times the global warming potential of carbon dioxide. Therefore, I devised a project question on how my 100 acre farm could be managed, so as to limit its greenhouse gas emissions (without affecting farm profit) to within a 13% increase of its 1990 emission levels by 2012. These targets were chosen because they mirror exactly the national obligation imposed on Ireland by Kyoto.

Having trawled through a plethora of resources, the project concluded that the most economically feasible way for my farm to meet the Kyoto target would be to install an anaerobic digester to treat the animal and dairy wastes. Anaerobic digesters can convert farm residues into a concentrated fertiliser and methane gas. This 'biogas' can be used as a renewable energy source on the farm thus reducing greenhouse gas emissions. While I didn't follow through and put a digester on the farm, the project experience spawned my interest in bioenergy.

As time passed on and European agricultural policies evolved, firstly with Agenda 2000 and particularly the reforms instigated by Franz Fischler in 2003, it became increasingly apparent to me that as a 35 year old farmer, operating at a relatively modest scale and with a high level of family responsibility, that I was facing some considerable challenges. Of course, I'm not alone. Thousands of others are in a similar situation.

This question of how to chart the most effective future course for our family farm was occupying my mind when I saw the invitation for applications for a Nuffield Farming Scholarship advertised in the Irish Farmer's Journal. Instinctively, I felt compelled to apply.

The question was; how would I translate my farm's predicament into a tangible study proposal?

I thought of my Open University project. While researching it, I had come across the fact that hundreds of thousands of hectares in the United States are devoted to growing corn, as a raw material for ethanol, which is then used as a renewable transport fuel. This had struck me as odd. Why does a country that abandoned the Kyoto process on climate change, and that is regarded among many environmentalists as an ecological delinquent, have such an apparently vibrant renewable fuel industry?

I was particularly curious about the farmers underpinning it. Had they switched from a mainstream agricultural enterprise to become bio-fuel producers? What pressures prompted them to switch? Or was the move triggered by the identification of a new and lucrative market for agricultural produce? What structures did they use to organise themselves? Were they dependant on state support or were they self-reliant? I was especially struck by the possibility, that maybe, just maybe, their story might contain a parable for how farmers, like me, could confront the future.

Therefore, a study proposal centred on the social, political and economic frameworks on which the ethanol industry in the US mid-west is based was submitted. When granted with the Irish Cooperative Organisation Society award, I was certainly, delighted, but also more than a little daunted about the challenge that lay ahead.

Throughout, I felt it was worth remembering that dairy farming had been very good to me. After all, if the increase in the value of farm assets was added to farm profits and a value placed on lifestyle, then my eleven years as a dairy farmer had left me considerably better off than many of my contemporaries in the non-farm sector. However, with the relentless decline in the value of traditional farm commodities and the forthcoming decoupling of farm subsidies from production, radical changes do seem inevitable.

Nevertheless, we live in an era of unprecedented innovation, with historically low interest rates. Farm opportunities should be bountiful. Despite this, the agricultural industry seems to be gripped by a fatalistic assumption that farmers face considerable economic hardship.

Rather than taking one side or the other, it is the ambition of this report to steer a middle course; to be more realistic and hopeful, than either overly doom-laden or wildly optimistic. It does not purport to represent the absolute truth (if there is any such thing), just my interpretation of the events and experiences afforded to me by virtue of a Nuffield Farming Scholarship. In this vein, the report intends to follow the advice of the psychologist, R.J. Lifton:

'If one does not look into the abyss, one is being wishful by simply not confronting the truth.....On the other hand, it is imperative that one does not get stuck in the abyss.'

Some may look at the difficulty of reversing current trends and despair; they are stuck in the abyss. Others may assume that things will work out ('they always do'); they are being wishful. This study assumes that the truth lies at neither extreme.

The Study

Energy sources available to farmers apart from biomass include wind, solar and hydro. However, bioenergy is unique because all farmers can consider it. It is not dependant upon prevailing wind speeds, hours of sunshine received or proximity to suitable water resources. Furthermore, bioenergy is not limited to supplying electricity and heat. It can provide gaseous, liquid and solid fuel sources that can be stored, transported and used in a large variety of situations.

Bioenergy raw materials are categorised in table 1 below:

<i>Bioenergy Resources</i>	<i>Examples</i>
Dedicated 'energy plantations'.	Short-rotation trees such as poplar and willow. Perennial crops such as miscanthus. Annual crops such as maize and sugarcane.
Residues from agricultural production.	Straw from a variety of cereal crops. Other residues from food and industrial crops.
By-products and woody residues from a variety of processes.	Sawdust, bark chippings, wood shavings. Manure.

The study proposal had been confined to the bio-ethanol industry in the United States. However, it became apparent that the study could usefully be broadened to consider some of the other bioenergy options, and that an understanding of the status and the impact of bioenergy in Ireland and the EU would be valuable.

Ireland

The Irish Bioenergy Association is based in Thurles, County Tipperary. It is a voluntary and self-governing organisation that was launched in May 1999 to promote and develop bioenergy in the island of Ireland. One of the triggers for the formation of the organisation was the perceived need to respond to the opportunities that were expected to follow after the publication of the 1998 EU white paper entitled "Energy for the Future – Renewable Sources of Energy". It proposed a doubling of renewable energy production from 6% to 12 % of the EU's total primary energy need by 2010. With these policy initiatives coming from the top, rapid growth in the bioenergy sector might be expected.

However, Ireland is at the bottom of European league tables for the percentage of energy produced from renewable sources and from agricultural wastes. The following were mentioned as being among the chief constraints on the bioenergy sector:

- The production of energy from biomass provides an integrated solution with many benefits and a range of by-products other than energy. This means that bioenergy falls into the 'pigeon holes' of several government departments, and no one department has been willing to instigate support.

- Electricity production is being deregulated very slowly, resulting in what could best be described as a "broad brush" approach to the development of energy policy with virtually no focus on bioenergy from agriculture. In particular, gaining access to the national electricity grid is a significant obstacle for bioenergy projects.
- The unique external benefits of bioenergy as a means of managing organic waste and as a potential solution to nutrient management problems on farms are not generally recognised or valued. Hence, within the renewable energy mix, bioenergy has been over-shadowed by wind energy.

However a number of pragmatic reasons exist as to why bioenergy should have a future in Ireland:

- **Energy security.** Ireland imports 90% of its energy needs. Furthermore, 80% of Ireland's energy expenditure is on heat and transport fuel, both of which are more efficiently derived from biomass, than from other renewable resources.
- **Bioenergy is climate friendly.** Fossil fuel combustion emits carbon to the atmosphere that was laid down hundreds of millions of years ago. In contrast, bioenergy merely recycles carbon over a time frame of seasons or possibly months.
- **Bioenergy could help Ireland save 4.3 billion euro.** Bioenergy would help Ireland to meet its Kyoto target. Ireland's aggregate greenhouse gas emissions are currently 40% above their 1990 levels and if current trends continue we will face a 4.3 billion euro penalty in 2012.
- **Bioenergy is cheap.** By factoring in the Kyoto fine with Ireland's very favourable climate for growing any type of biomass together with the utility value of bioenergy as a waste management tool, it transpires that we have the ability to produce competitively priced energy from short rotation forestry, sugar crops, starch crops, oil crops and herbaceous lignocellulosic crops such as miscanthus. In addition, farmers who wish to concentrate on food production could still produce bioenergy profitably from waste streams.

Therefore while the current status of bioenergy in Ireland is low, it is not surprising that there is a rapidly growing body of interest in the concept of using biomass for non-food purposes. For example:

- Beltra Forestry, a private company based in County Mayo is a partner in a European Commission funded project to build a biorefinery capable of converting agricultural produce into added value biochemicals.
- Wexford Renewable Fuels is a small farmer owned company in the south-east of Ireland that processes oilseed rape into a renewable liquid biofuel.
- A combined heat and power plant is being built in Enniskeane, County Cork, that will combust forestry residues and thinnings, thus providing a new market for farmer owned forestry enterprises.

Therefore, while the bioenergy sector in Ireland may be frustrated, it is certainly not despondent.

Denmark

As the Ryanair flight from London-Stanstead to Esbjerg in south-western Denmark started to descend an off-shore wind farm came into view. It was an impressive sight. Situated approximately two miles from the Danish coast, it consisted of hundreds of shiny windmills, arranged in a large rectangle, protruding from the surface of the North Sea. It seemed to represent a perfect reflection of Denmark's reputation as a world leader in renewable energy.

The University of Southern Denmark

I had been advised that Jens Bo Holm-Nielsen at the University of Southern Denmark was an expert on Denmark's bioenergy programme. Producing methane from manure and burning residues to fire district heating systems are the primary activities in the Danish bioenergy sector. Being a dairy farmer, I decided to concentrate on the latter. My visit to Denmark coincided with a workshop, held at the university on 'The Future of Biogas in Europe'.

The workshop was a two-day affair dealing with technological, environmental and socio-economic aspects pertaining to the anaerobic digestion (AD) of organic waste (particularly farm manure) and the use of the methane as an energy source. Considering that the workshop was so focused on farm waste management, I was amazed to realise that I was the only farmer there. In fact, apart from a couple of representatives from rendering plants who were considering AD as a way of dealing with their waste streams the workshop was devoid of commercial interests. Academics and government officials were the dominant species.

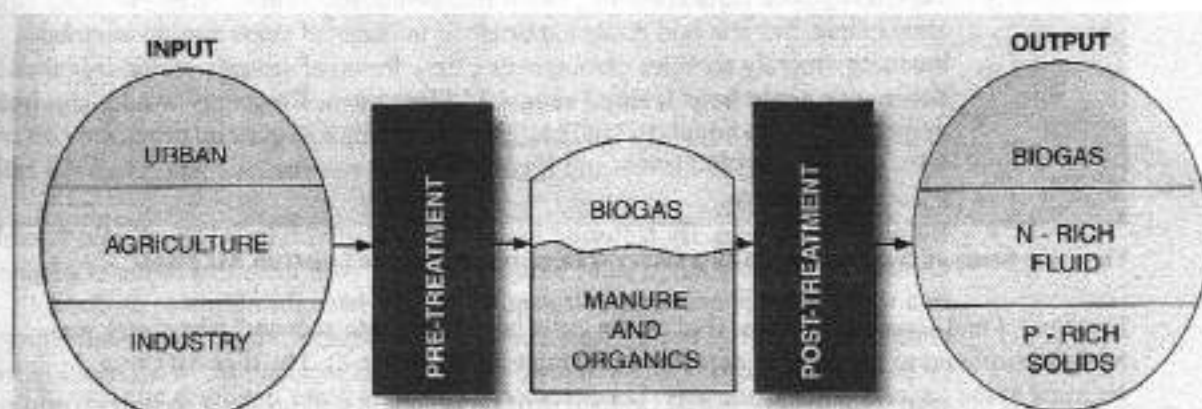


Figure 1: The Biogas Concept (Courtesy of Dansk Biogas)

Anaerobic digestion involves the bacterial decomposition of manure in a mechanical digester that is deprived of oxygen (Figure 1). In effect, it is the opposite of composting, which is an aerobic or oxygen-utilizing process. The fermentation process lasts 15-21 days. The biogas that is produced typically comprises 60% methane, with the remainder consisting of carbon dioxide and small amounts of acidic gases. The advantages of using AD to a farmer are:

- It allows farmers to respond to new regulations demanding more effective management of nutrients.
- It reduces the risk of the spread of pathogens and weed seeds.
- It offers an opportunity to reduce odour.
- It can generate income from the sale of methane. (Denmark has a national grid of natural gas pipelines that biogas producers can link up with.) Other revenues arise from the sale of the digestate, either as compost or an enriched fertiliser. Also, the opportunity exists (subject to regulatory approval) to take in organic material from other waste producers, such as the catering industry, for a 'gate fee'.
- Where the gas and digestate are used on-site, financial savings are achieved through the reduced expenditure on synthetic fertilisers and energy.

Green Farm Energy, Lojstrup

Having heard the experts, I was looking forward to visiting some farms with AD units in place. My first visit was to a new plant installed on a pig farm near Lojstrup in the centre of Denmark. It was designed to cater for a group of farmers in the area. I was surprised by the

array of complex, heavy industrial type of machinery that was involved (Figure 2). It transpired that much of the complexity arose from the regulatory requirement that acidic gases such as hydrogen sulphide and ammonia, which are produced in parallel with the methane, are not emitted to the atmosphere.

The plant manager was very upbeat about the project. It was designed to deal with 35,000 tonnes of manure a year and would produce 8.5 million kwh of electricity yielding a gross annual income of 770,000 euro. In addition, there would be income from the sale of the nutrient enriched digestate and from 'gate fees' charged to non-members who supply waste. The initial 10 million euro investment was expected to have a pay back period of 5/6 years.



Figure 2: Some of the structures and a slurry transport truck at the Løjstrup AD plant.

However, I had some misgivings. Had all the costs been taken into account? The slurry was being transported to the plant in expensive looking trucks (Figure 2). The digestate was returned to the farmers in the same way. Furthermore, Denmark's water quality is an issue of public concern. Therefore, couldn't the market for a nutrient enriched digestate be very vulnerable to further restrictions on fertiliser use?

I wondered if the farmers involved were 'jumping through hoops' to manage their current waste problems rather than proactively attempting to broaden the scope of their enterprises for future profit?

Thorso Biogas Plant

The Thorso Environmental Biogas plant is a co-operatively owned enterprise comprising 75 farmers. Viggo Bjoern, a farmer and a board member, explained that the co-op had benefited from a government grant of 18% to build the plant and that the slurry suppliers had each received 40% grants to establish a nine month storage capacity for the digestate. His pride in the plant as a solution to nutrient management challenges and as a generator of renewable energy was self-evident. The gas was being fed to a combined heat and power unit where it was converted into energy for use in a nearby village.

However, Mr. Bjoern candidly admitted that the plant which was ten years old had yet to produce a profit and that farmer interest in AD is driven by the fact that farmers are being denied the right to expand stock numbers unless they can demonstrate that they have the capacity to manage the extra manure in an environmentally friendly way.

BOX 1: AD – A Defensive Strategy....

Danish farmers are carrying a heavy regulatory burden. They have already confronted the type of challenges that now face Irish farmers as a result of the implementation of the EU Nitrates Directive. While their AD plants are an innovative and environmentally friendly waste management solution, they are not proactively improving the commercial viability of many farmers. In fact, by facilitating farmers (particularly those at the margins of profitability) to maintain their historic production choices in an environmentally acceptable way, the AD plants, and the significant investment that they represent could undermine the ability of Danish farmers to be responsive and adaptable to changing market signals. It is an example of farmers using bioenergy as a means of defending what they already have, rather than as an offensive strategy to diversify and capture new markets.

I met Mr Arthur Wellinger, an expert on renewable energy from Switzerland, and he argued that the most important factor stimulating or hindering bioenergy is society. For example, if people elect right-wing governments, then in general renewable energy and environmental programmes will be cut and it will be argued that climate change and fossil fuel scarcity are myths. While the public may be supportive of renewables in principle; this support can quickly dissolve if they are more expensive than fossil fuel alternatives. He suggested that I should study what is happening at the European level to promote renewable energy, both within civil society, as expressed by non-governmental organisations, and within the EU institutions themselves.

Brussels

Acbiom, the governing body of the European national bioenergy associations were holding a meeting on 'EU legislation to promote bioenergy'. I scheduled my visit to Brussels around this event.

Acbiom

A range of speakers from the EU, the banking sector and private enterprise made presentations at the meeting. The issues raised that made the most impression on me were:

- The EU's renewable energy targets are indicative only. They are not legally binding.
- There is a fear that mandating the use of bioenergy with legally binding targets would create a market that would be filled by outsiders. For example, Brazil is producing over 4 billion gallons a year of bioethanol from sugar cane, unsubsidised.
- Only the UK and Germany have their greenhouse gas emissions under control and the EU will struggle to abide by its commitments under the Kyoto Protocol.
- The Emissions Trading Directive that deals with the creation of an emissions market for greenhouse gases applies to industrial processes of in excess of 20 megawatts. In other words, farmers and agriculture are outside the loop.
- The legal remit of Common Agricultural Policy does not extend to energy crops for the production of energy. The 45 euro per hectare payment for energy crops under the recent CAP reform is only meant to compensate farmers for the presumed lower value of energy crops vis-a-vis food crops. It is not regarded as an energy subsidy.

The claim that Brazil is producing bioethanol without government subsidies merits some clarification. While Brazilian sugar cane growers do not get direct payments or tax rebates the domestic ethanol market is heavily distorted by government interventions. These include repeated devaluations of the Brazilian currency, decrees on how much ethanol must be

blended with petrol, intervention buying and stock maintenance, state support for the building of mill-distilleries and banning diesel in government vehicles.

COPA-COGECA

I visited the offices of COPA/COGECA that is the umbrella group for national farmer organisations. They presented me with a couple of policy papers on climate change and renewable energy that were certainly supportive, but also rather vague and stronger in hope than in belief. I got the distinct impression that bioenergy was not a priority. Are farmers too preoccupied with trade and price support issues to be bothered with bioenergy?

The Worldwide Fund for Nature (WWF)

I met with Stephen Singer of the WWF. He informed me that the WWF has a 3,800 person staff, an annual budget of \$340 million and 3.25 million members in the EU. Furthermore, the WWF regard bioenergy as a socially and environmentally sustainable energy source.

He presented me with data showing the seemingly inexorable rise in atmospheric carbon dioxide concentrations and explained how the EU's climate target of limiting future temperature rises to within 2 degrees Celsius of the pre-industrial level would require radical and immediate cuts in fossil fuel use (Figure 3).

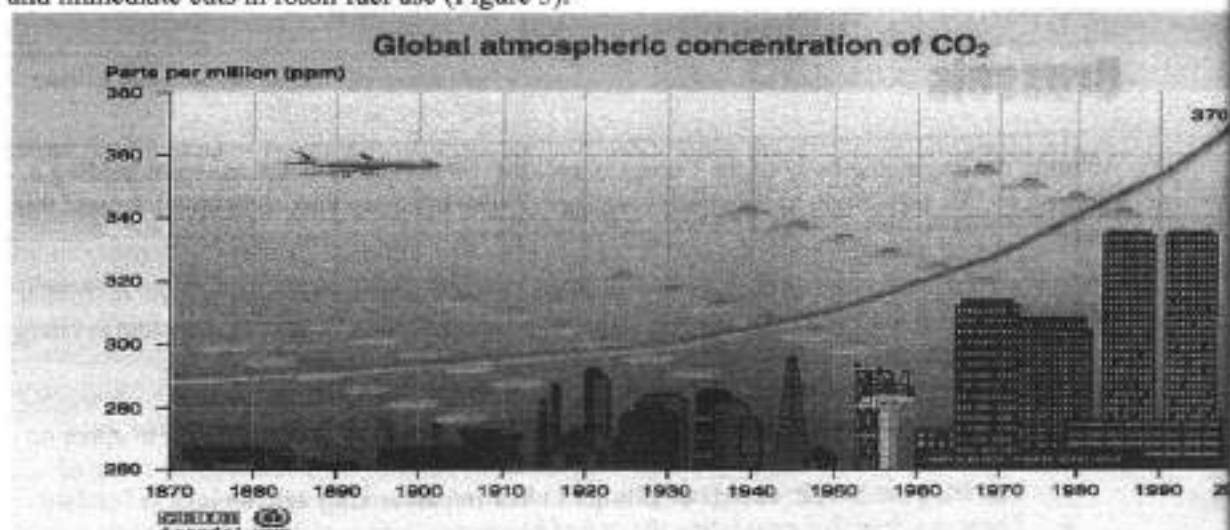


Figure 3: The rise in atmospheric carbon since 1870 (Courtesy Climate Ark).

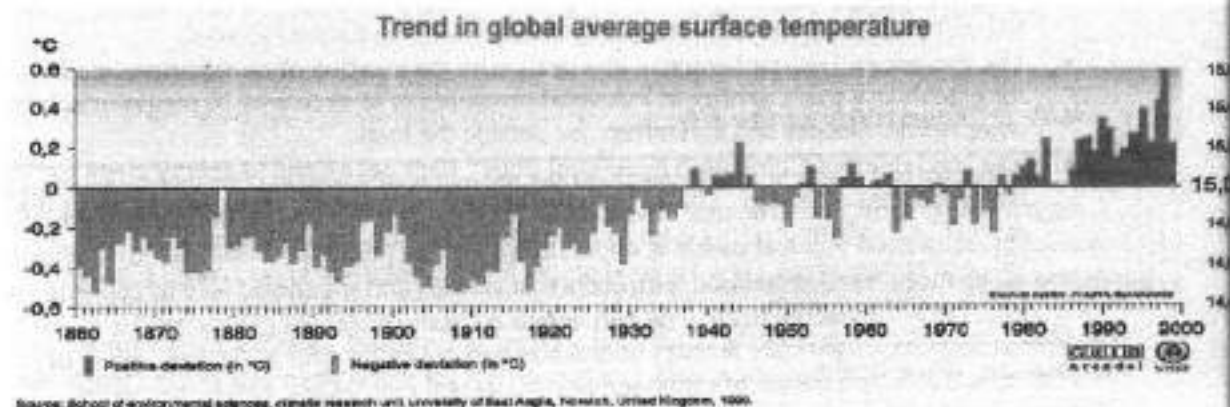


Figure 4: Trend in global temperatures (Courtesy Climate Ark).

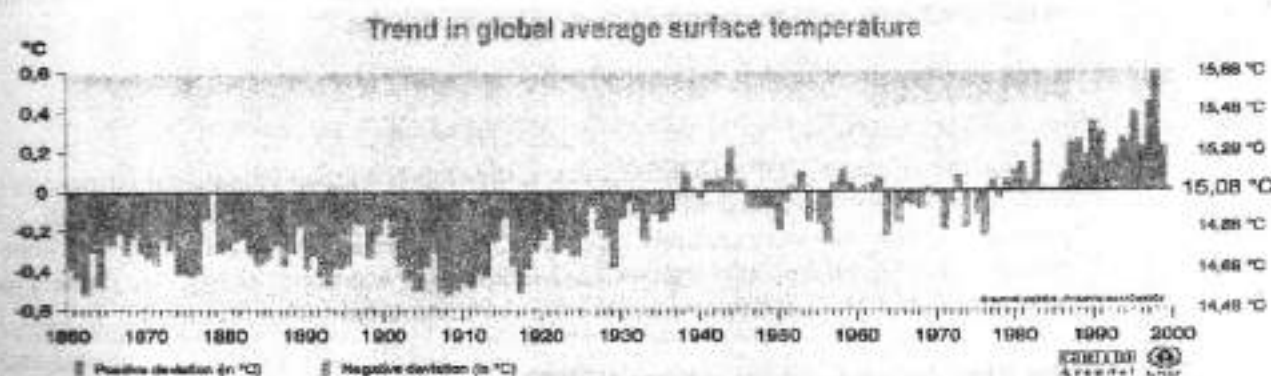


Figure 4: Trend in global temperatures (courtesy Climate Ark).

Stephen also had strong views on the market distortions caused by energy subsidies. The figures he provided are reproduced below:

<i>Energy Source</i>	<i>Subsidies</i>
Nuclear	Between 1947 and 1999 the US nuclear industry received \$145 billion – 96% of all US energy subsidies.
Fossil Fuels	Globally, fossil fuels receive \$150 billion every year in subsidies.
Renewables	Renewables (wind and solar) received \$5.7 billion in subsidies between 1975 and 1999.

He argued that people and in particular markets need a reality check to dispel the myth that renewables are too expensive. He went on to say that without a radical turn around in energy investment priorities, the world's climate could descend into chaos.

While Stephen Singer accepted that the WWF and farmers may find it difficult to agree on every issue; he acknowledged that if there was farmer interest in advancing the cause of bioenergy then the WWF would be willing to work in partnership with them.

In June 2004, the WWF published a report on bioenergy titled '*Bio PowerSwitch: A biomass blueprint to meet 15% of OECD electricity demand by 2020*', in which it emphasises the rural development aspects to bioenergy.

BOX 2 : Bioenergy in the EU.....

Leaving Brussels, I was a bit confused about the prospects of bioenergy. Its path seemed to be clogged with a variety of structural obstacles including cumbersome regulations, fossil fuel subsidies, social and political paranoia about higher energy prices, confusion about how to integrate environmental protection with economic growth and a general lack of appreciation of the benefits of bioenergy itself. The only interested parties seemed to be academics, environmentalists, large-scale forestry companies and only a handful of farmers, many of whom turned to it as a means of satisfying environmental regulations, rather than as an expression of entrepreneurial endeavour.

The United States of America .

I had not been to the US before, nor had I been away from home for an extended period since I started farming. I felt some trepidation. My first stop was Minnesota.

Minnesota and Illinois

I arrived in the 'Twin Cities' of Minneapolis and St. Paul expecting freezing temperatures. To my surprise there was something of a mid-November heat wave and people were generally wearing short-sleeved shirts in the pleasant mid-day sun. I had also been carrying a vision in my head, that all big American cities were caricatures of New York, where everybody rushes and attends exclusively to their own business, to the extent that a person dying on the sidewalk would be simply stepped over rather than helped. This was also wrong. Residents of the Twin Cities (Figure 5) were relaxed, friendly and very helpful.

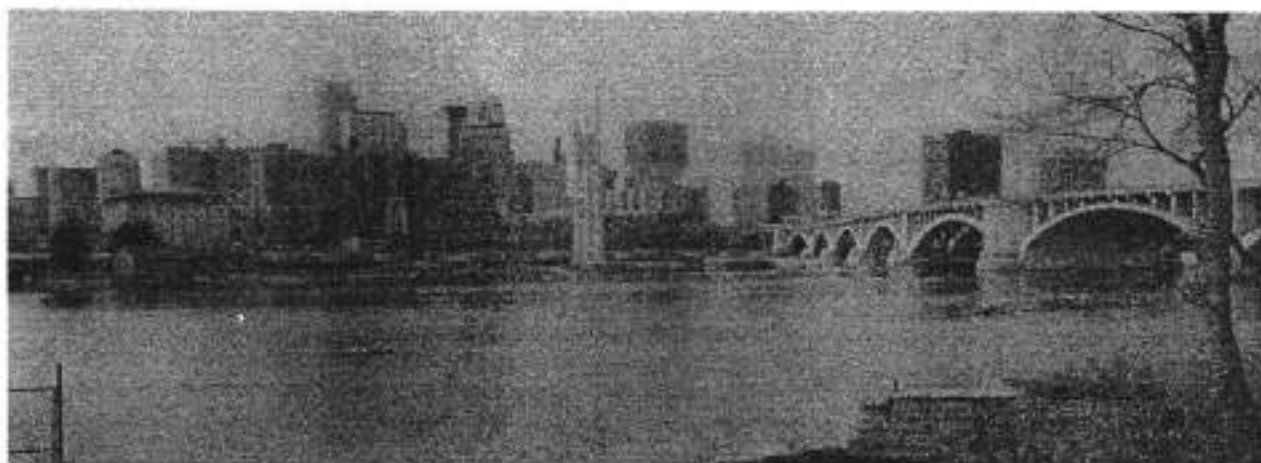


Figure 5: Downtown Minneapolis from across the Mississippi river which separates it from St. Paul, hence the title 'Twin Cities'.

Minnesotan Department of Agriculture

Mr. Ralph Groschen gave me an overview of Minnesota's ethanol programme. He explained that the market for ethanol is underpinned by the 1990 Clean Air Act which mandates that all gasoline products be blended with an oxygenate so that they combust more cleanly. A fossil fuel derivative, commonly called MTBE can serve this purpose. But so can ethanol, which contains 35% oxygen. However, when it was learned that MTBE is a carcinogen, many individual states introduced tax exemptions for ethanol blends and financial incentives for the ethanol industry. Minnesota was the first in this regard.

Ethanol production in Minnesota has expanded from 24 million gallons in 1994 to a projected 386 million gallons in 2003. This expansion was facilitated by a tax rebate of 53 cents per gallon of ethanol from the federal government and by a 20 cent per gallon payment from the state of Minnesota to ethanol producers. This payment applies to the first 15 million gallons produced by an ethanol plant and is guaranteed to last for 10 years from when the plant commences production. This effectively amounts to a grant of \$3 million per plant per year.

Furthermore, of the 14 ethanol plants in Minnesota, 12 are farmer controlled in the form of new generation co-operatives. As such, Ralph argued, farmers were in a position where they could ensure that they were the ones to benefit from the state payment and not a corporate

on to argue that the demise of government central planning in Russia and elsewhere had been replaced by 'corporation controlled central planning'.

- Ethanol prices track oil prices and are not influenced by the raw commodity value of corn (Table 2).

Table 2: Value of corn (US\$) Raw commodity versus value added – per bushel of corn

Date	Corn – Raw Commodity	Corn – Value Added (ethanol & DDG)
July 1996	4.68	5.33
December 1996	2.46	4.13
July 1998	2.14	3.67
December 1998	1.86	3.33
July 2000	1.48	4.20
December 2000	1.85	5.18
July 2002	2.17	3.56
December 2002	2.11	3.83

Corn-er Stone, Luverne

Mr. David Kolsrud, is a farmer director on the board of an ethanol plant called 'Corn-er Stone' in Luverne in south-west Minnesota. How had David got involved in ethanol production?

David explained that growing up in the 1960s, he was taught that 'hard work equalled success'. In the 1970s, things became more difficult. To compete with other low cost producers, it was necessary to specialise. 'Bigger is better' was the mantra and neighbours competed with each other in the race to expand. Expensive new technology was purchased, but the downward spiral in the price of commodities was relentless and in desperation farmers became politically active. It was this surge of 'bottom-up' action that led directly to the introduction of the 20-cent producer payment for ethanol in 1986. Nine years passed before the commissioning of the first ethanol plant. The traditional conservatism of farmers, which made the switch to biofuel production seem very radical, was hard to breakdown.

David's plant is an NGC and he explained that it differed from a traditional co-op in that it has a closed membership; members provide significant capital investment for plant infrastructure and are committed to delivering fixed amounts of raw material for as long as they are members. If a member wishes to break his/her relationship with the NGC, they can sell their stake in the business into what is effectively a free market and the new member must then honour the feedstock delivery obligations associated with membership. David, strongly, considered himself to be a 'co-op man'. In fact, he described the ethanol plants in Minnesota as 'community based enterprises'.

David had strong views on 'farmer power'. As an example, he described how there are 300,000 farmers in the US. If only 100,000 of them leveraged \$100,000 each then they would have \$10 billion. His point was that if farmers can agree on a common goal, then they have the economic clout to bring it to fruition.

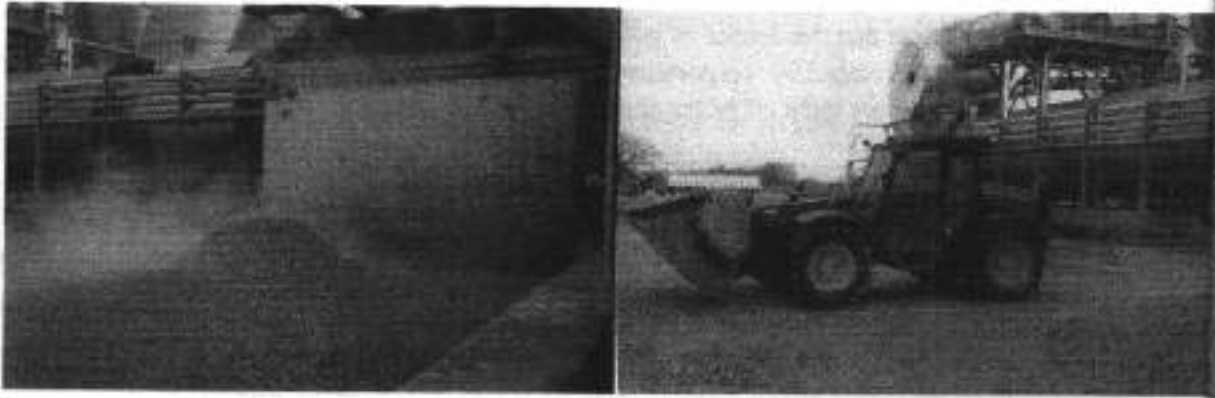


Figure 6: Distillers dried grains (DDGs) are an important by-product of dry-mill ethanol plants. Much of it is exported to the EU.



Figure 7: Wind energy in the Great Plains. David Kolsrud sees more long term potential in wind than in ethanol.

Al-Corn, Claremont

Mr. Randal Doyal, is the manager at Al-Corn in Claremont, about 60 miles south of Minneapolis. He supported the contention that NGCs are truer to the co-operative ethos than traditional co-ops. He explained that hybrid versions of the basic NGC can be constructed so that private investors can participate, but with farmer control retained. Other interesting observations that he made included:

- That the work of biotechnology companies, such as Monsanto and DuPont was very useful to growers. He argued that there were no dangers associated with these technologies and that people were too easily 'perturbed by myths'.
- That in some instances, the returns from ethanol were so attractive that farmers were less inclined to follow normal crop rotation practices and instead were sowing 'corn on corn'. This resulted in a greater reliance on inputs of fertilisers and pesticides.
- That co-operative marketing in the form of a loosely based coalition between individual ethanol plants was important. While care had to be taken not to violate anti-trust laws, it enabled producers to avoid competing with, and undercutting, each other to supply the same gasoline blender. It also reduced marketing costs.



Figure 8: The Al-Corn plant in Claremont.

Adkins Energy LLC, Lena, Illinois

I felt it would be useful to visit a plant outside of Minnesota, where there might be a different regulatory environment. I contacted Adkins Energy Cooperative of Lena in northern Illinois. Mr. Darius Simler, the president of the board, gave me some of his time. I was pleased to discover that, like me, he is a dairy farmer.



Figure 9: Adkins Energy LLC, weigh bridge and plant.

Darius explained that in spring 1994, the idea of establishing an ethanol plant in Lena was mooted. The motivation for the idea stemmed from the realisation that if they were to preserve the legacy of their forefathers in terms of retaining ownership of their land and maintaining their rural way of life, then a radical restructuring of their farm enterprises was necessary. Ethanol production was a comfortable fit with their existing enterprises because many farmers in the area were already corn growers. The NGC model had to be adopted because continuity of supply of the corn was critically important and because of the scale of the investment required.

The plant, which has 298 farm members, cost \$68 million to develop. It is currently producing 40 million gallons per year and this capacity could easily be doubled. It was necessary for the farmer members to raise 40% of the capital cost in order for the banking sector to agree to fund the balance. To meet this requirement, Adkins Energy LLC (Limited Liability Company) was set up. Adkins Energy Co-op owns 49% of this entity with the balance of the stake held by Pearl City Elevator Co-op (a traditional Co-op) and 3 other investor owned companies. A board of eleven people, of which 6 are farmer suppliers, oversee the running of the business.

While Adkins Energy does benefit from Federal tax relief of 53 cent per gallon, there is no 20-cent producer payment in Illinois, as there is in Minnesota. Hence plants in Illinois tend to be bigger. When I visited the plant, the price being paid to farmer members for their corn was less than what it would fetch on the feed market. Darius also acknowledged that the market value of the co-op shares had fallen significantly, since their launch. Nevertheless, Darius's optimism that the stock would appreciate in value was palpable.

Furthermore, it is intended to repay the \$45 million loan outstanding to the banks before 2010. As much as this enterprise was borne out of a desire for commercial success, it was clearly underpinned by a strong sense of conviction that it simply had to be done. Pride in one's community, love for one's way of life and the desire to pass on these traditions to the next generation were underlying forces that drove the farmers in Lena to start Adkins Energy. These values are combined with a level of determination and perseverance that simply commands respect. I will be very surprised if Adkins Energy Co-op fails.

I drove out of Lena feeling inspired. In conservative communities with a strong sense of tradition, growing corn to produce ethanol could be construed as crazy. It takes courage and vision to confront and overcome this kind of inertia.

Perhaps what most impressed me about farmers like David Kolsrud and Darius Simler is their belief in community values. Instead of attempting to improve their own situation in the self-obsessed way that capitalism and markets encourage, they threw in their lot with neighbours and friends so that challenges and successes were shared. It had a synergistic effect. One person's success became everyone's success.

Box 3: The Energy Efficiency Issue.....

Does the energy needed to grow corn and process it into ethanol exceed the energy derived from the ethanol itself? In the 1990s the agriculture professor from the Cornell University, Mr. David Pimental, calculated that ethanol was 70% energy negative and he claimed that ethanol production comprised 'subsidised food burning'. However some of the assumptions in the Pimental study have been questioned. Furthermore, the efficiency of the ethanol production process is being constantly improved. It is now widely accepted that corn-derived ethanol is 34% energy positive (Shapouri et al, 2002). In other words, for every unit of energy invested in producing ethanol, 1.34 units are returned when the ethanol is used. From an environmental perspective, this level of energy efficiency is considered too marginal. Hence, groups such as the WWF are reluctant to advocate the merits of biofuels. In their view wood energy holds the most promise.

The Haubenschild Dairy Farm and Anaerobic Digester

Ethanol production is not the only type of bioenergy in the Mid-West. Anaerobic digestion (AD) of manure is attracting increasing levels of interest, particularly as livestock farms are undergoing rapid consolidation. This gives rise to the problem of how to deal with large volumes of manure. For many, AD is the answer. Single farm plants are the norm, unlike in Denmark where community run facilities are common.

The Haubenschild dairy farm in Princeton, Minnesota, with 850 cows, is a good example. The simplicity of their digestion facility was most impressive. The engine, at the heart of the plant, had come from a decommissioned truck (Figure 10)



Figure 10: The engine driving the Haubenschild anaerobic digester.

The energy production facts are as follows:

- 70,000 cubic feet of biogas are produced daily, which is converted into 3000 kilowatt hours of electricity.
- The farm has saved \$400 per month in winter heating costs by using waste heat from the generator to heat barn space.
- An annual saving of \$40,000 per year has been achieved on the farm electricity bill.
- Surplus electricity is being sold to East Central Energy, yielding annual revenues of about \$40,000.

The Haubenschild's expected the payback period on the capital investment to be about 5 to 6 years. I found this easy to believe. However a fair amount of on-farm know-how and ingenuity was evident, particularly with regard to the integration of the second-hand engine into the system. Furthermore, it was apparent that the acidic by-products associated with the biogas were being emitted to the atmosphere, and not scrubbed out, as they would have to be in Denmark. Nevertheless, it was refreshing to see a real farm achieving significant returns from anaerobic digestion.

Bioenergy and Environmental, Wheaton, Illinois

Impressive as the set-up at the Haubenschild farm was, I silently questioned its pertinence as an example to most Irish farms, given that our scale of operation is so much smaller. By a stroke of good fortune, I met Jun Yoshitani from Wheaton, Illinois. He runs a company called Bioenergy & Environmental, which offers 'technical solutions based on proven processes and technologies', to environmental problems.

Jun is developing an AD system that would be more suitable for smaller herds. He is attempting to adapt AD technology to their needs by using ultra-sound to break down the manure before it enters the digester. As a result, the retention time in the digester is reduced from 15-21 days to about 5. Furthermore, the volume of the digestate is reduced and biogas yields are enhanced. From the farmer's point of view this means that the AD unit can be smaller, giving rise to a lower capital investment, and the extra methane improves the financial returns.

In fact, I have been in email contact with Jun recently and he now intends to incorporate a facility whereby phosphorous and nitrogen can be stripped from the digestate within the process. He claims that it will be up and running by the end of 2004. While for Jun, this is a commercial business venture and patents are pending on the processes that he is developing,

he argues very persuasively that this technology will not only have environmental benefits, but also significant social benefits.

Bixby Biomass Pellets

Another interesting bioenergy entrepreneur in Minnesota is Bob Walker of Bixby Energy Systems. A native of North Dakota and with an agricultural background, the experience of having to deal with a monthly \$1,700 heating oil bill led him to the conclusion that biomass is the alternative energy source with the greatest potential for reducing energy costs.

Bob's business involves producing pellets from corn cobs, wood trimmings, grape and tobacco waste, almond shells, cotton gin trash or any other suitable organic residue available that is available, free of charge. The pellets are delivered in bulk to domestic users as a heat source. He also sells the stoves that burn the pellets.

He picked out a couple of key points that he felt had contributed to the success of his business:

- To give his customers the confidence to purchase his stoves it was important that they could use oil as well as pellets. The stoves were selling for \$2999 and Bob claimed that demand far exceeded supply.
- He coats the pellets in a blue wax which not only helped to build a brand identity (he calls his pellets *Bixby Blue*), but also prevents deterioration of the product from either moisture or infestation by insects and rodents.
- Every time a delivery of pellets is made, the ash from the previous lot is taken away. The emphasis is on making biomass energy user-friendly.

Like many of the people I had met, Bob's will to succeed was almost overwhelming. He told me that Bixby Energy will start distributing their systems in Europe and China before long. Regardless of whether this business achieves its ambitions, there must be a genuine opportunity for an entrepreneur in Ireland/UK to replicate this type of business model.

The Institute for Local Self-Reliance

There are hundreds, if not thousands of bioenergy based businesses in the US mid-west. However, rather than studying the sector in a piecemeal way, I wanted to try to bring it's various strands together, so as to get a deeper, and more holistic, understanding of what has brought it to where it is.

The Institute for Local Self-Reliance is a non-profit research and educational organisation that provides technical assistance and information on environmentally sound economic development strategies. It has an office in Minneapolis, and Mr. David Morris, the Institute's vice-president gave me some of his time.

Regarding bioenergy in the US mid-west, David argued that biofuels have a distinct advantage over wind and solar energy, because they have 'molecules'. The fact that biofuels are made of matter means that they can be stored, used as required, and converted into multiple end-uses. Almost any chemical or fuel made from petroleum can also be made from plant matter. Unlike the supposed hydrogen economy of the future, which David regards as little more than a 'castle in the sky', he believes that the switch to a biofuel-based economy could be made immediately.

With specific reference to Minnesota's ethanol programme, David was adamant that the evolution of new generation co-operatives (NGCs) triggered rural economies into moving up the 'value-added' chain. He said that they were key to facilitating the switch which farmers made from selling basic commodities, to peddling construction materials, ethanol, industrial bio-chemicals and motor oil. As a result of farmers broadening the scope of their production, in conjunction with the NGC model, rural communities had a much better chance of retaining democratic control over, and ownership of, local resources.

David made many other points, some of which are:

- The World Trade Organisation (WTO) is a flawed institution. In isolating trade from social and environmental issues it undermines people's human rights. In contrast, the EU, which began as a free trade organisation, quickly realised that trade does not take place in a vacuum and it proactively built institutions to deal with the inevitable social and environmental fallout from liberalised markets.
- Undemocratic trade rules, propagated by the WTO, favour global corporations, that are causing the displacement of locally owned and controlled businesses in every sector, not just in agriculture.
- Renewable energy might just be the 'silver bullet' to redress the disparity in power between citizens and corporations. While it may have to be triggered by a climate shock or oil scarcity, a renewable energy society is very probable, and because renewable resources are dispersed, and not concentrated like fossil resources, such a society will, by definition, be decentralised.

BOX 4 : Farmer Empowerment.....

A regularly recurring theme through the study was farmer empowerment. Particularly in the US, there was a palpable sense that the process of globalisation, with the attendant trade and investment rules, strongly favours global agribusiness over smaller-scale and more localised producers. For example, many farmers were aware that that 75% of the world's cereal commodity market is controlled by 5 grain-trading companies (Rural Advancement Foundation, 2000). Thus, farmers are caught in a trap, where both their inputs for farm production and their outlets for distribution are controlled by an ever-smaller number of giant corporations, which also control commodity price markets. The decision to form producer owned and controlled co-operatives (NGCs) for ethanol production is, in large part, an expression of farmer resistance to the domination of corporations. It is an example of farmers fighting to regain control over their own destinies. As such, the issue of farmer empowerment is central to this study.

Missouri

Biotechnology is playing a very important role in the biofuel sector. Firstly, the crops in the field are being genetically modified (GM) so that their starch content is increased, enabling them to produce more ethanol. Secondly, the enzymes used in the ethanol plants to break down the plant matter are undergoing constant redevelopment to make them more potent and efficient. Having contacted a number of biotech companies such as DuPont, Novozymes and Genencor International, I eventually, with the help of an Irish friend, managed to get approval for a visit to Monsanto.

Monsanto, Chesterfield, St Louis

I was given a tour of the facility by Mr. Gary Barton. He told me that Monsanto spends \$540 million annually on research and development of which 90% is on seeds and genomes and 10% on chemical sprays. This is at odds with the industry average of investing 30% on seeds and 70% on sprays. He consistently presented GM as a tool that farmers can select to deploy, if they wish, to make their business more efficient.

In the afternoon, I met with Matt Kraus who works on Monsanto's bioenergy programme. Bioenergy is important to Monsanto because the percentage of the US corn crop destined for ethanol production has grown from 6% in 1999 to a predicted 12% in 2005.

For Monsanto, developing high starch varieties of corn that give higher volumes of ethanol is a great opportunity to produce a high volume demand side or 'output trait' product. Monsanto varieties give 3% more ethanol than the average. Matt argued that this was very good. For a 40 million gallon plant it would translate into an extra 1.2million gallons of ethanol without any additional capital investment.

But what potential does this kind of biotechnology hold for Irish agriculture? Matt agreed that the economic merits of growing GM energy crops would be less significant in a situation where the scale of agriculture is smaller. He suggested that the best option for a potential biofuel industry in Ireland might be to convert agricultural residues such as straw and forestry waste into ethanol using enzymatic hydrolysis. In this regard, he said that I should check out Iogen Corporation in Ontario, Canada.



Figure 9: Monsanto's premises at Chesterfield, St. Louis. The glass houses on the roof of the building are used for small-scale trials and experiments.

BOX 4: *The Schmeiser Case....*

I had been following the Percy Schmeiser case in Canada. Private investigators, acting on behalf of Monsanto, had found GM rapeseed growing on his 1,000 acre farm. Schmeiser argued that the GM plants were the result of unwanted wind-blown genetic pollution and therefore, that he had not breached Monsanto's patent on the product. However, Monsanto took legal proceedings against him, and the Canadian courts backed Monsanto, ruling that the GM plants that had been found on Schmeiser's farm were the rightful property of the corporation. On this issue, Gary Barton and Matt Kraus defended Monsanto's right to protect its intellectual property and asserted that the publicity being given to the case was politically motivated. They reminded me that if Monsanto did not respect farmer's rights, and address their concerns and needs in a meaningful way, then logically farmers would cease to exercise their purchasing decisions in Monsanto's favour and Monsanto itself would cease to exist. They argued that regardless of the rules, market forces would prevent Monsanto from abusing their position.

Iogen Corporation and Purevision Technology Inc.

Having checked the Weather Channel, and seen that there was 15 inches of snow in Duluth, north Minnesota, which is just south of Ontario, I decided that driving up to the Iogen Corporation would not be wise. Instead, I spoke with Mr Carl Lehrburger of Purevision Technology, a small research company in Colorado and he confirmed that they are also developing a process that converts residues into ethanol. His belief was that PureVision's technology would permit ethanol to be produced from the corn stalks and the cobs, thereby doubling the yield of ethanol from a given corn crop. Looking a little further into the future, he believes that it will be feasible to produce ethanol from virtually all organic wastes.

Meanwhile, the Iogen Corporation are to start construction of the first ligno-cellulose derived ethanol plant in early 2005 which will use cereal straw as a feedstock. Thereafter, they intend to distribute the technology and enzymes on a turn-key basis. This has huge potential and almost certainly represents the future course of the bio-fuel industry.

What this indicates is that the current wave of bio-refineries (which convert the starch found in the edible portion of food crops into ethanol) are an interim technology. It raises the possibility of farmer-owned bio-refineries being able to maximise the value extracted from each ton of biomass in the same way as oil companies do from fossil fuels right now. For example, oil refineries prefer to manufacture petro-chemicals to jet fuel, jet fuel to petrol, petrol to kerosene and the dregs are used to make tar for paving the roads. Bio-refineries could operate in a similar entrepreneurial manner, by targeting chemicals first, liquid bio-fuels second, electricity third and then pelletize the residues for the domestic heat market.

The University of Columbia – New Generation Cooperatives

I was very keen to learn more about new generation co-operatives (NGCs), which seemed to be intrinsic to the success, from a farmer's point of view, of the US ethanol industry. By a circuitous route, I heard about a PhD student in the University of Columbia, in central Missouri, who is doing a thesis, on models for development in the bioenergy sector. Ira Altman is a farmer's son from Saskatchewan in Canada.

Ira confirmed that the NGC model is now viewed as a serious organisational structure, both among farmers wishing to form new co-ops and more traditional co-ops looking for ways to adapt. NGCs are also viewed favourably by commercial banks, and as the 20-cent producer payment in Minnesota shows, state governments respect them as vehicles for attaining rural development goals.

The impetus for NGCs arose from the need to restructure existing markets, so as to provide producers with an increasing share of the consumer's expenditure on agricultural produce. For example, in 1910, of every dollar generated by agriculture, the farmer retained \$0.41. By 2001 the farmers share had dwindled by more than 75% to under \$0.08. Higher farm yields and expanded markets for farm products had not translated into higher net incomes. Therefore, NGCs are a vehicle whereby farmers can get a portion of the profits that lie beyond the farm gate. It is this value-added focus of NGCs which distinguishes them from the broad objectives of commodity and input marketing which characterise established co-operatives.

Delivery shares and restricted membership are the two features which distinguish NGCs. This arises from their focus on processing. To allocate the right of delivery among members and to raise capital, the co-op sells delivery shares. Each share both entitles and obliges a member to

deliver one unit of farm produce, such as a bushel of corn. Thus, NGCs represent an attempt to 'vertically integrate' the relationship between the farm and the consumer.

However, there are also internal advantages to the co-op member arising from the NGC model. For example, when a traditional co-op matures the sense of common purpose which triggered the establishment of the co-op in the first instance often fades, especially as farmers separate into those working full-time on the farm and those with off-farm jobs. Moreover, as co-ops expand their operations, into new areas of activity, farmer suppliers tend to relinquish more control to a paid management; thus making the co-op and the corporation more alike. This results in a greatly reduced sense of ownership by the members over the co-op, which is termed as a 'property-rights problem'.

The various strands of the so-called property-rights problems of traditional co-operatives are presented in Table 3:

<i>Property-right issue</i>	<i>Description</i>
The Free-Rider Problem	Since minimal investment is required for membership, co-ops tend to have high debt levels.
The Horizon Problem	No tradable shares to reflect the long term benefits of investments. Hence, activities with short term returns are favoured.
The Control Problem	The absence of a free market for trading shares means that share price cannot be used to gauge management performance.
The Portfolio Problem	Members cannot respond to their changing preferences by adjusting the scale of their investment. Instead they try to influence management.
The Influence Costs Problem	Members can be suppliers and owners, or just owners. Therefore, management is sometimes compromised and must expend time on consensus building between differing standpoints.

In NGCs the free rider problem, the horizon problem and the portfolio problem are largely eliminated. While the control problem and the influence costs problems can remain, they are usually reduced, largely because of the typically narrow focus of an NGC.

Some NGCs do very well. The farmer suppliers at Al-Corn in Minnesota have seen their delivery shares rise in value by over 200%. However, others do poorly. In February 2001, Phenix Biocomposites filed for bankruptcy protection, a step that could cost nearly 1,000 farmer-owners more than \$10 million.

Do NGCs represent a model for development that could work in Ireland? Could NGCs be a buttress capable of empowering farmers in the face of the escalating concentration of interests taking place in the wider agricultural industry? Could they be means of bridging the gap, in

terms of the returns on equity invested, between corporate shareholders and coop shareholders while retaining the advantages of being a coop member? I certainly think so.

University of Florida

Naples was the venue for the 'Agricultural Trade and Policy Conference' organised by the the University of Florida. The conference was concerned with the challenges that farmers face in increasingly liberalised markets. It was attended primarily by academics from universities, government officials and a scattering of lobbyists, media people and politicians all of whom clearly knew each other very well. Nevertheless, I enjoyed it immensely.



Figure 10: Naples sits prettily on the shores of the Gulf of Mexico.

The conference highlighted for me that farmers on both sides of the Atlantic share the same challenges: fear of Brazilian exports, being rendered uncompetitive by environmental regulations, making the switch from being production driven to being market driven and how to generate income from non-commodity goods and services. The issue of 'farmer power' was a constant undercurrent. Robert Taylor, an economist from Alabama began his presentation by saying:

'Farmers are surrounded by bankers, railroad magnates and food processors who profit from their effective collusive control of the market while the foolish farmer does little more than identify with the very people who are most adept at exploiting him'.

OUCH! This statement was written by a farmer called Thorstein Velblen in 1923. He went on to claim that:

'The world is going to have a global economy without a global government. This means a global economy with no enforceable, agreed-upon set of rules and regulations, no sheriff to enforce codes of acceptable behaviour, no judges and juries to appeal to if one feels that justice is not being done.'

He labelled it: 'The New Cowboy Economy'. To me, this was compelling stuff. Was he right, just partly right, or completely daft? The conference dinner that evening helped me to form an opinion. It was addressed by Mr. Charles Bronson, the State Commissioner of the Department of Agriculture and Consumer Services. He began by acknowledging that the price that farmers receive for their products is under pressure, but he assured us that it was the same for the farmers in California, the farmers in the other 50 US states and for South American farmers. He then went on to urge Floridian farmers to keep their competitive spirit alive and

that they would prevail; and in particular that they would *'beat the brains out the Californian citrus growers'*.

Why should farmers have to beat the brains out of each other? Why should farmers have to engage in a style of gladiatorial market warfare that can only have one winner? - The corporation that controls the market. In a brain-bashing contest there are no winners, just various degrees of failure.

A. Duda & Sons, Inc., Oviedo, Florida

After the conference, I teamed up with two university researchers and a young radio-journalist to visit Mr. A. Duda who manages a 45,000 hectare citrus farm (figure 13). My three colleagues wanted to get an insight into how new water regulations were impacting on agricultural practice. The US government is spending \$7.8 billion to restore the Everglades after a disastrous drainage scheme, early in the last century, which resulted in a region renowned for its swamps and wetlands, being scarce in water.

However, contrary to what I was expecting, Mr. Duda was the most empowered farmer that I ever met. Regarding markets, he described how the promotion of the 'Fresh from Florida' label had increased his margins by one cent per fruit. With respect to irrigation water, he assured us that paying for irrigation rights, is not something that would happen in his lifetime. Desalination plants, to make sea water potable, would have to be built on the coast to cater for urban needs. He went on to declare that the more regulations that came in the better, *'because they can't implement anything without us farmers doing it for them'*. I asked him where his sense of confidence and empowerment came from?



Figure 11: The Duda citrus farm in Oviedo (45,000 hectares of this).

He said that he learned that power is cultivated by working with people, not against them. With regard to government regulators and officers from the Environmental Protection Agency, he buses them in and shows them what he is doing. Furthermore, big sums of money are shelled out to lobbyists in Washington so that farmer interests are always represented. *'You've got to work from the inside to maximise influence'*, he said.

According to Mr. Duda, empowerment is within farmers own grasp. The rules of the game are not stacked against us, it's just that we don't play the game in the right way. But then again, Mr Duda's farm was massive, over a thousand times larger than mine. Could it be that this is the level of scale required for a sense of empowerment?

The International Carbon Bank and Exchange, Gainesville

One environmental issue that clearly did not enjoy the same status in the US as in Europe was climate change. Before leaving Florida, I spoke with Mr. Bock Folken of the International Carbon Bank and Exchange. This rather grand name belied the fact that the business seemed to be run via a computer in Mr. Folken's basement. The company had been established on the back of the anticipated US participation in the Kyoto process. Putting it mildly, the subsequent abandonment of Kyoto by President Bush was a serious set back to Mr. Folken's business plans.

Nevertheless, he was persevering by trying to build a voluntary market for carbon emission permits, with his business acting as a broker between buyers and sellers. However, he believes that the US stance on the issue will remain one of, *'the American lifestyle is not negotiable'*, and that unless the technical ability to sequester carbon dioxide from fossil fuel, so that it does not enter the atmosphere, is developed, and at a cost of less than \$10 dollars per tonne, then the US will remain outside the process. Bock's prediction has a ring of realism about it.

BOX 5: Energy Politics in the US.....

The case for bioenergy in the US is being driven, almost exclusively, by energy security concerns. The slogan *'Foreign Oil Fuels Terrorism'*, (used by ethanol producers in South Dakota) while crude and untrue, does reflect the kind of basic thinking used to justify public expenditure on bioenergy programs. However, without a solid foundation, renewable energy policies in general, face the threat of being sidelined by nuclear power as a preferred solution to energy security problems and also to climate concerns. Therefore, there is a real danger that bioenergy could remain a fringe activity rather than a core part of a multi-functional agriculture. On many fronts, this would be a great pity, but not least, because bioenergy needs the technological leadership of the US in forging renewable technologies.

Switzerland: The WTO

Economic globalisation, in directing farmers towards reviewing their production choices, is having a profound influence on the bioenergy sector. Therefore, to get a clearer understanding of the process, I visited the World Trade Organisation (WTO). My visit to Geneva coincided with a public symposium at the WTO headquarters entitled *'Multilateralism at a Crossroads'*.

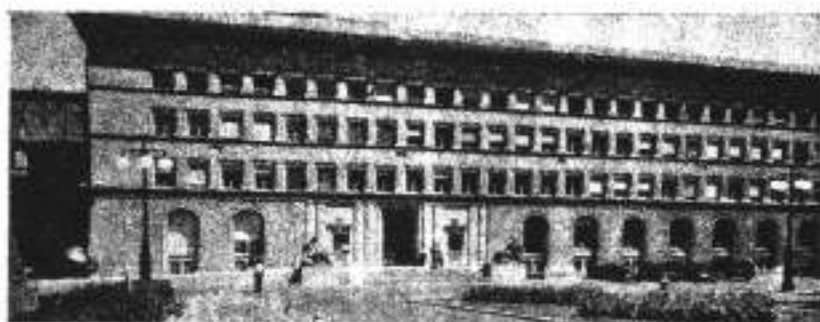


Figure 12: William Rappard Centre, Geneva.

The William Rappard Centre, where the WTO is based, is most impressive, surrounded by beautifully maintained gardens, on the shores of Lake Geneva. Mr. Breffni Carpenter, an official attached to Ireland's Department of Agriculture, who is based in Geneva, very kindly gave me a comprehensive introduction to the structures and methods of the WTO. On the first

morning of the symposium, there was a tangible air of anticipation, for the presentation of the EU trade commissioner, Mr. Pascal Lamy. It had the atmosphere of a giant poker school.

While the nuances of Lamy's words clearly held more meaning for others than they did for me, the pre-eminence of agriculture as a trade issue was striking. It seems that the anti-capitalist movement have agriculture to thank for obstructing the path of unencumbered free world trade.

Whatever about free trade, the symposium was certainly an exemplary demonstration of free speech. To its proponents, economic globalisation and free trade, is a 'silver bullet' that will cure most of the world's ills, particularly grinding poverty. To its critics it is a 'false dawn'; a dogma driven by corporate greed, that hysterically sees trade as an end in itself, rather than a means to an end. However among all sides there was an air of acceptance that it is happening, and a general belief that it is unstoppable. Among the points which struck me most forcefully were:

- **The omnipresence of NGOs.** Oxfam, World Wildlife Fund, Third World Network, Friends of the Earth, Royal Society for the Prevention of Cruelty to Animals, Consumers International and even The Quakers had a very vocal and visible presence.
- **The CAP has vocal critics.** Phrases like 'dirty decoupling', 'the CAP is a trap' and 'the CAP is smoke in our eyes' were widely used. They arise from the view that decoupling is incomplete because payments are still attached to land, some EU states have opted for partial decoupling, the historical production on which they are based is too recent to make an impact on farmer's actual production choices and that the CAP's budget of 50 billion euro has not been reduced. As such, it was argued that the CAP is still trade distorting.
- **Farmers everywhere have the same problems.** Whether its coffee farmers who operate in an almost completely free market, cotton and tobacco farmers whose markets are highly distorted by trade measures, or dairy and beef farmers who are somewhere in between; farmers both in developed and developing countries are finding it increasingly difficult to achieve a price for their products that covers their production costs.
- **Everyone is in a group.** There are more groups, at the WTO, than at an MTV music awards ceremony. G19, G20, G77, G90, Cairns Group (rumoured to be splitting), Mercusor, Annex I, Annex II and more. It's possible to be in more than one group. South Africa was accused of being in every group apart from ABBA. Coalitions of common position, strategic alliances and loosely defined networks are ubiquitous. They are particularly vital to smaller and economically weaker countries to ensure that their interests are not sidelined.

Is trade liberalisation an enemy? Taking Ireland as an example; by virtue of keeping its economy open and friendly to corporate investment, it has come from having just 63% of the EU's average per capita GDP in 1973 to being its second wealthiest member today (next to Luxembourg). But, the experience of the farming sector is different. Irrespective of the efficiencies that we make, or the expansion of our markets, whether we are citrus growers, coffee producers or dairy farmers the downward spiral in the real returns that we achieve in the marketplace, has been relentless.

This is market failure. Three centuries ago, Adam Smith, the father of neo-classical economics, decreed that markets fail in the absence of perfect competition. It still holds true today. The corporate entities that control the food chain from the farm gate to the consumer are dynamic, mobile and unconstrained entities. They can grow exponentially, amalgamate at will, and outsource their requirements if the figures justify it.

Meanwhile, as farmers, we are coupled to our land, restricted in our production choices by nature and we can't outsource. We are trapped in a game where we compete with each other, goaded into striving for greater scale and efficiency, so that the corporate middleman can take a higher margin from the market. It is a cycle that looks set to continue until, the last farmers standing are comparative in scale, to the corporate purchasers of farm commodities.

Producer owned co-operatives, bioenergy and businesses which serve local markets are a response to the competitive imbalance between farmers and corporations. However, if the bioenergy sector becomes attractive enough, the corporate machine will move in and take it over. Evidence of this is already evident in the ethanol business in the US, where the corporate giant Archer Daniels Midland based in Macon, Illinois processes 750 million gallons of ethanol.

BOX 6: *The International Co-operative Alliance (ICA)*

The ICA gives a global voice to the 725 million people involved in co-operatives through out the world. It is based in Geneva, and I met its agricultural advisor, Mr. Chan-Ho Choi. He spoke about the inherent conflict in capitalism, where we are alternatively producers in search of the highest price for what we produce and consumers in search of the lowest prices for what we consume. The result is what we see among farmers today, where an ever decreasing proportion of us are empowered to produce an ever increasing proportion of the world's food. The co-operative can overcome this inherent dichotomy because it is owned by both its suppliers and its customers. Regarding the new generation cooperatives, Mr. Choi suggested that they represent a pragmatic way of surviving in the world as it is.

Conclusions

This study has found that farmer interest in bioenergy is driven by:

1. The desire to defend their position in the face of tougher environmental regulations as demonstrated by the community owned anaerobic digestion plants in Denmark.
2. The need to escape the tyranny of corporate dominated export markets by capturing new local-based markets, which is exemplified by the farmer-owned ethanol plants in the US.
3. A proactive sense of opportunism that wants to broaden the scope and improve the viability of the existing farm business of which the Haubenschild anaerobic digester is an example.
4. The identification of bioenergy as an business opportunity that can work in a market setting independently of the farm, such as Bixby Energy in Minnesota.

Towards a Biobased Society

Looking to the future, the study finds that advances in biotechnology, and heightened social and political demand for products and services, which strengthen energy security and protect the climate, are set to work in conjunction with the changing economics of traditional agricultural enterprises to render bioenergy production, an important farming activity in the future. Furthermore, bioenergy has the potential to reinvigorate rural economies, and serve as a stepping stone to the attainment of a greater degree of farmer empowerment.

In a biobased society, renewable carbon, derived from plants, will replace fossil carbon from the era of the dinosaurs. In this way carbon will be recycled, resulting in much lower greenhouse gas emissions. The biobased economy abides by the principle of waste minimisation, because the by-products of one process, such as food or timber production, are used as the raw materials for another. The anaerobic digestion of manure epitomises this concept.

Waste to Wealth

Today, the typical ethanol production process uses starch from the edible portion of food crops such as corn. At the current retail price of fossil fuels, ethanol manufactured in this way, cannot be competitive without tax rebates and subsidies. However, this report believes that the route to competitive bioenergy products is to use the non-food portion of plants, the waste products of the farming and forestry sectors, and where appropriate single purpose energy crops. Key in this regard, are the exciting developments in the biotechnology sector, which it is predicted, will enable the current generation of ethanol plants in the US to be adapted to use agricultural residues, rather than food crops as a feedstock.

The wave of biorefineries in the US is the result of a political and social response to competitive imbalances in the traditional feed markets. These markets are dominated and controlled by a tiny number of globally based corporations that have the power to pit farmers from distant corners of the planet in competition against each other. Hence, farmer producers of commodities for export are locked in 'a race to the bottom' while corporate profits swell.

While for farmers, the alternative outlet for their produce provided by the ethanol plants is a lifeline, it is to be hoped that competitive balance in the market place can be restored.

Political action by farmers and civil society acting together, in conjunction with the anticipated doubling of world food demand by 2030, may underpin this restoration.

But the arrival of a biobased economy can be hastened. The length of time that we spend waiting for it depends to a significant degree on how quickly governments and financial institutions are prepared to switch subsidies and investment from fossil fuel and nuclear energy systems, to renewable energy. Making the switch in a timely fashion, will soften the economic shock of an inevitable oil scarcity and reduce the temptation of choosing nuclear as the favoured energy source of the future. As farmers we can play a pivotal role in demonstrating to policy makers and to society in general that the immediate phasing in of a renewable energy economy is the best option.

If we fail to take on this role, events may cause the opportunity to pass us by. While the budget of the CAP at 50 billion euro may seem puny in comparison to the largesse dished out to the oil and nuclear giants, it remains very significant to farmers. However, as the political impetus to disassociate payments to farmers from food production strengthens, there will be a strong temptation to weaken the CAP. Bioenergy production adds social and environmental value to the work that farmers do, and can bolster the argument for a strong CAP post 2013/14.

People Power, Principles and Profits

A strong, vibrant and imaginative co-operative sector has a key role to play in empowering farmers in a globalised economy. That does not mean that the co-operative vehicle isn't already contributing. It is. Even in the US, the heartland of competitive capitalism, there are over 45,000 co-operatives operating in a large variety of sectors, and that more Americans own a share in a co-op than a share in the stock market. But the truth is that if we lived in a world that placed more value in people than on money, the 100s of millions of people around the world who are co-op members would be far more powerful than the relatively tiny number of people who control corporations. As things stand it is clearly the other way around.

However, there is a strong current of conservatism running through the co-operative movement. There are good historical reasons for this. Many co-ops, including those in the Irish agri-sector were established to defend farmers and rural communities from the ravages of a free market that, in reality, was dominated by narrow vested interests. And, in this respect, farmer's interests still need to be defended. But, the traditional conservatism of the co-op movement must not become a hindrance as it strives to adapt to the present-day world.

In conservative communities with a strong sense of tradition, growing corn to produce ethanol could be construed as crazy. It takes courage and vision to confront and overcome this kind of inertia. Furthermore, courageous leadership, imagination and grass-roots effort are the bedrock on which the new generation of co-ops (NGCs) in the US mid-west are built.

But, NGCs are not simply, a model created, to meet the specific structural requirements of ethanol plants or biorefineries. They are, first and foremost, an evolutionary adaptation to the increasingly industrial nature of agriculture, which is characterised by the increasing fraction of the total value of agricultural produce that is added outside of the farm. The NGC gives the farmer the opportunity to benefit from the 'value added chain'.

Secondly, NGCs are a response to the weaknesses of traditional co-ops. In particular, they address the areas in which co-operative shareholders are disadvantaged in comparison with their corporate counterparts, whilst preserving the merits of co-operative membership. In other words, people are empowered, principles and ideals are maintained, and profits accrue to the primary producer.

It's a Net-Worked Planet

However, the challenge which is posed to farmers by imbalanced market competition is far too intractable to be solved by a switch to the production of non-traditional commodities for local use, and co-operative development alone. Political action is also required. But, what form should it take? It is true that our declining numbers and diminished relative economic importance has undermined our clout at national level. Furthermore, European integration and economic globalisation has given rise to a progressive transfer of power upwards to supra-national bodies such as the EU and the WTO. While political action at the national level remains important, it is even more vital that our interests are heard, and acted upon, in the transnational institutions.

Networking is a way of doing this. We must work on the development of alliances and coalitions of common interest, on issues of mutual importance, with other actors or bodies, wherever they may be. In particular, civil society organisations and the NGO sector should be targeted. Issues of concern, that farmers have in common with them include corporate power, unfair trade rules, environmental protection, renewable energy, rural development and community empowerment, to name but a few.

These organisations have vast memberships, lavish funding, and their loud and colourful campaigns have a voice that is very influential. However, they don't differentiate farmers and agriculture from general corporate or mining interests. Farmers have a unique and distinct voice. But, the space that should be ours is filled with shrill cries for sacrifices from developed country farmers so as to ameliorate developing country poverty. This is wrong. The bar must be raised for all of us, not lowered and rebalanced.

It doesn't mean that we don't have to change. But we do need to directly confront the mindset that sees agriculture and farmers as a problem or an obstacle to progress. After all, who else is going to supply the 100% increase in food that is projected, by the UN, to be necessary by 2030? Agriculture should be seen as a solution. But, we need the freedom and the right to organise ourselves, at regional and world level, so that we can properly and fairly match the consolidation that has taken place outside the farm gate. If we don't, we will end up, 'beating each others brains out,' in a type of gladiatorial market warfare, that can only debase and impoverish all of us.

To communicate this message farmer organisations and interest groups should join forces and use the methods of the big NGOs. In so doing, farmers may present, not just a united voice, but one with sufficient scale and depth, to challenge corporate dominance and force the hands of policy makers.

...And as for Yours Truly...

An objective of this report was to define a course of action for my family farm in the context of the changes taking place in agricultural policy and the world in general.

The study has helped me to decide that, rather than ignoring or working against the changed agricultural regime, I should take full advantage of it. Wetter parts of the farm have already been planted for forestry. The dairy enterprise is under review and all options from expansion to liquidation are possible. I don't intend to live in fear of change. As events unfold, I intend to respond in the most effective way possible. Bioenergy, may well constitute a major part of a multi-functional and diversified farm portfolio.

Furthermore, having completed a BSc in Environmental Studies with the Open University, I intend to pursue the close links between agriculture, society and the environment by studying Environmental Decision Making, to MSc level.

On a final note, I was particularly inspired by the courage and the character of the farmers who got the producer owned ethanol plants established in the US mid-west. While I don't necessarily see myself as an ethanol producer, in terms of the spirit that they exemplify, I would like to think that I could take my cue from them.

Recommendations

To create a robust bioenergy market, financial incentives should be used to boost demand for bioenergy based products. Supply side incentives should be used cautiously because they can trigger market surpluses. In particular, action needs to be taken in the following areas:

- **Electricity price.** The price offered for electricity from biomass must reflect its true value to society. To generate investor confidence, this price should be fixed for a set period.
- **Excise duty relief.** Taxes on bioenergy products should be reduced or eliminated. Revenue shortfalls should be compensated for by carbon taxes.
- **Capital grants for biomass burners.** The use of biomass as a heat source in domestic and commercial buildings should be encouraged with immediate effect. In Ireland, grants for biomass burners could be linked to the 'First Time Buyers Grant'.
- **Mandate bioenergy use.** Legally binding targets for the inclusion of bioenergy in the overall energy mix should be set for the short to near term, until a robust bioenergy market is established.

To enable bioenergy producers to meet a rising demand, structural obstacles must be removed from the supply side. Action needs to be taken in the areas of:

- **Grid access.** Because of the dispersed nature of renewable resources the electricity grid must be made capable of accommodating multiple access points.
- **Streamline planning applications.** The development of the bioenergy sector is in the national interest. The planning process must establish unambiguous criteria, which if satisfied, automatically give bioenergy developers the right to proceed with projects.
- **Bioenergy at a 'single desk.'** The multi-characteristic nature of bioenergy, results in it falling into several 'pigeon-holes'. A 'single desk' needs to be created for bioenergy.

Bioenergy represents a wonderful opportunity for farmers to engage in value-added processing – an opportunity which they have failed to seize in other areas. Measures that would help farmers to grasp the opportunity before them include:

- **Making Technology affordable.** Companies and institutions that develop patented technologies using public money should be required to license these technologies to local based bioenergy developers on very reasonable terms.
- **Tradable carbon certificates for farmers.** Bioenergy developers should qualify for tradable carbon permits in recognition of the carbon emissions off-set as a result of their project.
- **Policy support for the development of new generation co-operatives.** The new co-ops have the potential to act as a countervailing force to the prevailing omnipotence of corporate dominated processors and retailers. A viable alternative model to that of the corporation would benefit, not just farmers, but all of society.

Disclaimer

This report is the result of my study and represents my findings and opinions which are not necessarily those of the Nuffield Farming Scholarships Trust or of my sponsor.

Acknowledgements

I am very honoured to have received a Nuffield Farming Scholarship. In this regard, I owe a great deal of thanks to the sponsors of my award, - The Irish Co-operative Organisation Society (ICOS). In particular, I am indebted to Mr. John Tyrrell, the Director General of ICOS, for his support and encouragement

This study has benefited from the advice and comments of the editor and assessors of Nuffield Farming Scholars reports. Also, a special word of thanks is also due to my colleagues in Nuffield Ireland, especially my two fellow Scholars from 2003, - Bryan Cunningham and John Geraghty.

The study could never have taken place without the generous co-operation of the people, who gave their time, to explain their views on the issues at the heart of this report. Some of them are mentioned in the body of the report. But, there are many others and I am thankful for all contributions.

Finally, without the support of my wife, Geraldine and our sons Ian, Conor and Brian nothing would have been possible. For their patience and good humour, I am especially grateful.

Geoff Dooley

Camas South

Bruff

County Limerick

Tel: + 353 61 382607

Mobile: +353 86 3615824

E-mail: jgdooley@eircom.net

As well as bestowing its own awards

NUFFIELD FARMING SCHOLARSHIPS TRUST

has been chosen by the following bodies

to administer their awards

THE FOOD CHAIN AWARDS

sponsored by

HSBC, The Royal Smithfield Club in association with the Royal Agricultural Societies of England, Scotland & Wales, The Crown Estates and the Farmers Fund

ALAN & ANNE BECKETT

BARCLAYS BANK

THE BEMB (R & E) TRUST

THE BRITISH POTATO COUNCIL AWARD

DARTINGTON CATTLE BREEDING TRUST AWARD

FRANK ARDEN MEMORIAL AWARD

THE FARMERS FUND

THE JOHN OLDACRE FOUNDATION

THE LINCOLNSHIRE AGRICULTURAL SOCIETY

THE PROFESSOR MAC COOPER NEWCASTLE UNIVERSITY

MARKS & SPENCER

NATWEST BANK

THE NORTHERN IRELAND (JIMMY YOUNG) AWARD

THE NORTHERN IRELAND (THOMAS HENRY) AWARD

THE ROYAL NORFOLK AGRICULTURAL ASSOCIATION

THE SOUTH OF ENGLAND AGRICULTURAL SOCIETY

THE STUDLEY COLLEGE TRUST

THE TREHANE TRUST

THE WORSHIPFUL COMPANY OF FRUITERERS

THE YORKSHIRE AGRICULTURAL SOCIETY

YOUNG NUFFIELD (BOB MATSON) AWARD