Proof of Evidence

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On behalf of: Ecological Land Cooperative Ltd
The Hub
5 Torrens Street
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Land at: Greenham Reach
Holcombe Rogus
Devon
(GR 307117 120011)

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Structure and endorsement of the Proof

This proof of evidence focuses on the likely impacts of the businesses proposed based on my knowledge of low input, labour intensive, ecologically managed holdings. The Proof first explains the need for more sustainable and localised food production and food security in the UK, and defines the concept of ecological agriculture. It then goes on to describe the likely results of converting land from conventional to ecological agriculture with regard to three key concerns: productivity, greenhouse gas emissions, and health concerns.

The evidence is accurate, concise and complete as to relevant facts within my field of knowledge and represents my honest and objective opinion. The evidence which I have prepared and provide for this appeal in this Proof is true and has been prepared and is given in accordance with guidance of my professional institution and I confirm that the opinions expressed are my true and professional opinions.

1. Summary of Proof

i) Rural planning policies will need to adapt to the impacts of food insecurity, fossil fuel depletion, and climate change on agriculture.

ii) Significant reports including from government concur that business-as-usual is not an option, and that farming structures will need to change dramatically with the adoption of alternative models of production and distribution toward bio-diverse, multifunctional ecologically based farming practices. This Scheme demonstrates such a model.

iii) Ecological agriculture is the science of applying ecological concepts and principles to the design and management of sustainable food systems. It is synonymous with and/or akin to non-certified organic production, agroforestry, and permaculture. The production approach advocated by this Scheme therefore has a sound scientific knowledge base.

iv) More sustainable, ecological agriculture would result in a decrease in the average size of UK land holdings and an increase in farm numbers. Further, farm labour will generally need to increase.

v) Taking as a baseline the previous land use of monocultural arable and over-stocked pasture, converting the land from conventional to ecological farming would lead to increased productivity and cost effectiveness, ecosystems services, and reduced GHG emissions in line with both planning policy and government policy and legislation.

vi) Establishing mixed, ecological holdings with low external inputs to supply local consumers will contribute to food security by increasing the supply of food crops whilst reducing dependency on fossil fuels.

vii) The Scheme's proposed monitoring and reporting, if undertaken with scientific rigour in conjunction with a research institution, will provide much needed data on changes to the land as a result of conversion to ecological agriculture, on the contribution the scheme may makes to the local economy.

viii) According to DEFRA, the average age of the UK farmer is 60 years old, and more than 60,000 new entrants to farming are required over the next 10 years. This Scheme is therefore clearly in line with the multi-institutional initiatives and government strategy to enable more people into farming.

ix) Given the high physical labour demands and long hours required for sustainable agriculture, any action to prevent habitation on the land that is being worked will reduce the efficiency of the business operation and of increasing localised food security. On the other hand, this Scheme could set an enlightened precedent for further temporary dwellings as will be required if the UK is to avoid a food security crisis in the future.

2. Expert's Qualifications

I have 28 years of experience in sustainable agriculture and food systems research and development, both in the UK and internationally. During this time I have worked at universities (Coventry, Merida Mexico), international agricultural research organisations (International Potato Centre Peru, and the United Nations), and the UK government (Department for International Development and Department for Food and Rural Affairs).

I hold a PhD in Ecological Agriculture and Food Security from Wageningen University in the Netherlands, an MSc in Sustainable Agriculture from Wye College London University, a Postgrad Diploma in Land Resource Planning from Silsoe College Cranfield University, and a BA in Environmental Studies from Trinity College University of Wales.

Currently I am Acting Director at the Centre for Agroecology and Food Security, an applied research initiative of Coventry University and the national organic charity Garden Organic. Here I run a Masters degree in Agroecology and Food Security, supervise PhD students, and undertake applied research and consultancy projects. Recent work has included project evaluation for the EU Caribbean programme, reviewing the Agriculture and Climate Change paper for DEFRA's Foresight Group, production of the report "Feeding 9 Billion with a Low Emissions Agriculture" for the Overseas Development Institute and Oxfam, and production of an independent definitive review "Agroecology and its Implications for Global Food Security".

I am a professional member of the British Ecological Society, an external reviewer for Writtle College's Horticulture MSc, on the Permaculture Research Advisory Board, and a member of the Leamington Spa Community Supported Agriculture group.

3. The context: the need for more sustainable and localised food production and food security in the UK

The consequences of a global increase in demand for food, water and energy, against a background of climate change, are all ingredients for the UK to be heading for what Chief Scientist Sir John Beddington has termed a "perfect storm" by 2030. The Climate Impacts Programme predicts the impacts of climate change across the UK until 2080 as being milder wetter winters, hotter drier summers, and more extreme weather incidents. Based on these predictions, the National Farmers Union has forecast major potential impacts on UK agriculture. These include a change in quality or composition of crops and grasslands, different irrigation and drainage needs, longer growing seasons, an increase in soil erosion and salinisation of groundwater. Rural livelihoods themselves may be affected by the need for changes in rural housing design, changes in agricultural markets, and the need for new skills, training and differing workloads. Clearly rural planning policies will need to adapt.

Not only does agriculture have to adapt to climate change, but it also has to reduce its contribution to global warming. Agriculture is a significant contributor to greenhouse gas emissions. The main sources are methane from livestock, nitrous oxide from agricultural soils, and carbon dioxide - mainly from energy and fuel use. Certain widespread practices also release carbon into the atmosphere, mainly deforestation, heavy and repeat ploughing, and the loss of soil fertility and thus of the capacity of the soil to store carbon. At the same time, the majority of global oil reserves may be exhausted as early as 2020, and this will severely affect the UK's food and farming system that is dependent on fossil fuels for production, storage, transport and retail. Government reports on UK food supplies consistently acknowledge the need for an increase in domestic production in order to ensure food security.

Significant commentators have speculated over the future direction for agriculture. These include the Chatham House briefing paper 'Thinking about the future of food' (Chatham House, 2008), the Transition Initiative led by Hopkins (2006), the report of the United Nation's-led International Assessment of Agricultural Knowledge, Science and Technology (IAASTD, 2008), Fairlie's assessment of food self-sufficiency scenarios (Fairlie, 2008) and the Food Ethics Council's toolkit on future scenarios for the UK food system (Steedman & Schulz, 2009). All concur that business-as-usual is not an option, and that farming structures will need to change dramatically with the adoption of alternative models of production and distribution toward bio-diverse, multifunctional ecologically based farming practices.

The government's new carbon budget requires that about 5% of the emission cuts that are expected to be delivered by 2020 should come from farming, land and waste management efforts. No targets have yet been set with regard to other agricultural or ecosystems services such as biodiversity, pollution or soil health.

This move toward the sustainable intensification of UK agriculture is entwined with increasing awareness and concern around human health and dietary related disease, and the cross-sectoral benefits (including to the NHS) of enabling consumers to connect with local and healthy food supplies.

The above concerns infer cause for more ecological approach to agriculture. This approach, of agroecology, means the science of applying ecological concepts and principles to the design and management of sustainable food systems. It is synonymous with and/or akin to non-certified organic production, agroforestry, and permaculture. Whereas millions of pounds have been invested by the private and public sector into conventional farming methods, only 1% of government funding has gone to develop more ecological production approaches, and therefore there is not only a lack of practice but also of knowledge around the development of best practice and particularly at local levels. A letter of support for the project concurs that "there is an imperative for dissemination of this concept and its practical progress. We need examples like this to illustrate what is possible with sensitive and integrated land use" (Dr M Wolfe, Elm Farm and Wakelyns Agroforestry, 5/12/11).

More sustainable, ecological agriculture places biophysical limitations on the capacity of farms to expand and specialise, and therefore the average size of UK land holdings would decrease and farm numbers would increase. Further, farm labour will generally need to increase owing to the broader range of on-farm activities, the increased requirement of knowledge and human skill to replace chemical and large scale mechanical inputs, and the shorter supply chains that gives opportunity for more on-farm processing and direct marketing operations.

Given the above, The Greenham Reach project is clearly pioneering an agro-ecological way forward for food production that is taking into consideration the forthcoming challenges that the production sector will face and that is endorsed and recommended by research and government bodies. Not only is it concerned with production aspects, but it is commendably taking a joined-up approach by also considering housing, markets and labour skills, with a focus on the use of local renewable resources and inputs so as to reduce the dependency on vulnerable imports and non-renewables. As climate change, peak oil and other challenges take effect, the trend for the agricultural landscape will highly likely be to move toward the model suggested by this project.

4. Likely results of converting the land from conventional to ecological farming

i) Productivity and cost effectiveness

Comparative studies from the 1970s and 1980s evaluating organic with conventional production suggested that organic yields were on average 20% lower than conventional in temperate environments. Since then, however, the balance has changed with the spread of highly productive ecological production techniques emanating from the Americas and Australia, and the development of methods that are able to measure the total productivity of more complex cropping systems.

Growing more than one crop in the same field, as promoted by permaculture, yields a higher total productivity than a monoculture crop. This can be measured using the Land Equivalent Ratio.

The development of more advanced economic models allows us to calculate the true medium and long term costs of conventional agriculture and the food system that it feeds into. Owing to the cleanup costs of polluting land and water, the human health costs induced by poor quality foods, the rising costs relating to the use of petroleum-based fossil fuels and agrochemical products and transporting feeds and inputs from abroad, these models now show that it is more cost effective to use ecological approaches.

Whereas short term productivity is an ineffective measure of agricultural performance, farm income is highly dependent on the management approach and overall purpose of the enterprise. A large proportion of UK farms and smallholdings bring in only part time incomes, largely owing to the way that food prices are kept low in the free market economy. Conventional arable and livestock farms are currently searching for ways to stay in business by cutting production costs, and one of the main avenues is to reduce the amount of agrochemical inputs and livestock feeds being imported onto the farm.

Ecological and permaculture management systems tend to place importance on multiple activities that do not all bring in a direct income, and yet a healthy turnover and profit can be made by including a small range of high-value commercial activities as part of the bigger system. For example, a soft fruit enterprise on 4ha of land in the South of England can make a turnover of £440,000 after 5 years, and a profit of £200,000 when Single Farm Payments and Organic Stewardship income are included.

The proposed farm business enterprises at Greenham Reach are of a complex nature that acknowledges the importance of spreading risk across a range of activities rather than a high-risk focus on one or two activities. On the land sizes in question, good incomes can

potentially be made. Diversifying activities means that a wider range of goods and services can be offered to the local community, as opposed to a narrow range of goods offered to a broader market reach.

ii) Greenhouse gas emissions and soil carbon management

The three most effective means to mitigate GHGS are good management of croplands and grazing lands, and the restoration of soil organic matter, as shown in Appendix JW/1, Appendix JW/2 lists key agricultural mitigation activities and indicates that the majority of these fall into the area of ecological agriculture. Compared to conventional farming, ecological practices avoid ammonium nitrate fertiliser the production of which emits GHGs, it encourages carbon sequestration, and livestock emissions are lower if the livestock are fed on legume pasture rather than feed concentrates.

Almost ninety percent of the GHG mitigation potential from agriculture comes from carbon sequestration. Carbon is held in soil organic matter and in above-ground biomass. Therefore, improved soil management practices for soil organic matter restoration and the production of large quantities of biomass through multi-story cropping hold a huge mitigation potential. Although the direct potential for carbon mitigation by livestock management is small, at 10%, absolute volumes are significant, and included in this is livestock feed that may either sequester carbon through improved grazing, or increase emissions through the production of grain-based concentrates and their transport.

Approximately 82% of terrestrial carbon is held below ground, within the soil (Harvey, 2008). Between 1997-99, an estimated 590 to 1,180 Mt carbon were locked up in cropland soils alone, in the form of soil organic matter from crop residues and manure. Whilst zero tillage increases soil carbon stores close to the surface, this stock may be returned to the atmosphere within months. By contrast, CO2 removed from the atmosphere by active growing roots of living plants and stored in soil humus can provide long term storage. Essential to this process is increased soil microbial activity to enable availability of soil minerals and other nutrients, and increase water retention and oxygen respiration.

Several contentious issues surround livestock production. Ruminants produce methane, and extensive grazing systems require more land and have a higher GHG footprint in terms of kg per product. However, this is offset by the value of ruminants in transforming plants and wastes that are inedible to the human digestive system into useful products: manure, meat, milk, materials, particularly on land unsuitable for crop production. Livestock are, of course, also a source of traction, and permanent pasture grazing systems can also increase the production of a glycoprotein named glomalin that is produced abundantly on hyphae and spores of arbuscular mycorrhizal fungi in soils and roots, that is itself a store for one third of all soil carbon.

The approach of the smallholdings at Greenham Reach is compliant with a low carbon and climate friendly strategy, through the use of photovoltaics and biological wastewater treatment system, the application of farming techniques that are low emitters of greenhouse gases and that increase carbon capture in the soil (for example through minimum tillage, zero use of agrochemical fertilisers, and the building of soil organic matter), and the low use of transport through on-site accommodation and processing facilities and the focus on local markets.

iii) Environmental and human health concerns

Water and air pollution: Agricultural pollution refers to the contaminants present in the environment as a result of agricultural practices. Most effects of agricultural pollution are felt in water environments and are caused by runoff from farms such as ammonia, pesticides, fertilizers, oil toxins, and animal waste that make their way into bodies of water. Fertilizers, manure, waste, and ammonia that are present in water release nitrogen that reduces the amount of oxygen present resulting in the death of fish and other marine animals. Agricultural pollution also negatively affects the quality of air. Globally, agricultural losses due to land degradation and contamination are valued at over £450 million annually.

Biodiversity conservation: Because of the tendency toward polycultures, organic methods, and localised cropping systems, ecological agriculture practices are more successful at supporting a broad and adapting diversity of crop species and livestock breeds that, because they have not been bred for yield maximisation, can thrive without the reliance on agrochemicals. The focus of markets toward the local also enables a broader range of food products to be commercialised. As well as this broad range of agrobiodiversity, wild diversity is also encouraged because of the low or zero use of toxins and the more diverse range of environmental niches on farm.

Risk of flood and drought: Water is better able to run through and off farm, and to be contained on farm, if the soil is in good health with a complex structure and microbiology, non-compacted by heavy machinery or over grazing, where there is a variety of crop rooting depths, increased trees on farm and along riperian strips, permanent soil cover to avoid drying out, and where ploughing – if any – is undertaken along rather than across contour to avoid erosion. All these approaches make judicious use of plants and of ecological processes. Neither conventional nor organic farming in the UK has historically taken account of water management, but it is the newer permaculture approaches from Australia that are proving to be effective now that extreme water events are more frequently occurring.

Human nutrition: There is nobody of evidence to show any human health advantages of consuming conventionally produced foods, whereas there is a substantial and growing body of evidence demonstrating that ecologically produced foods contain more desirable components and fewer harmful ones. The practice of conventional agriculture has led to a drop in mineral levels of fruit and vegetables in the UK of up to 76% between 1940 and 1991. This decline is attributed to the unintentional selecting-out of high nutrient crop varieties in breeding programmes, the use of shallow rooting annuals that are unable to tap into soil nutrients, and the failure to return a full complement of nutrients to the soil. Organically produced plant foods contain higher levels of vitamin C, minerals including iron and magnesium, phytochemicals (antioxidants), essential amino acids and dry matter content. They also contain 3-4 times lower risk off containing pesticide residues than conventionally produced foodstuffs.

Clearly, the approach of the Greenham Reach project to follow ecological and organic husbandry guidelines will do minimum harm to the environment, and in particular the biological waste treatment system proposed will actually turn a potential hazard into a solution in the form of a wetland nature habitat. This and the development of wild areas, the zero use of toxins and the diversity of cropping systems will increase both wild diversity and agrobiodiversity. The risk of extreme weather events impacting the project will be low owing to the improved management of on-farm water resources.

5. Conclusions

i) Taking as a baseline the previous land use of monocultural arable and over-stocked pasture, converting the land from conventional to ecological farming may lead to increased productivity and cost effectiveness, ecosystems services, and reduced GHG emissions in line with both planning policy and government policy and legislation.

ii) Establishing mixed, ecological holdings with low external inputs to supply local consumers will contribute to food security by increasing the supply of horticultural produce whilst reducing dependency on fossil fuels.

iii) Given the historical lack of public and private sector investment in research and development into ecological agriculture and localised food systems, the Scheme's proposed monitoring and reporting, if undertaken with scientific rigour in conjunction with a research institution, will provide much needed data on changes to the land as a result of conversion to ecological agriculture, on the contribution the scheme may makes to the local economy.

iv) According to DEFRA, the average age of the UK farmer is 60 years old, and more than 60,000 new entrants to farming are required over the next 10 years. Several initiatives have started to encourage new and young entrants into farming, including DEFRA's Agriskills Strategy and Action Plan, the Princes Countryside Trust, the Farmers Weekly, and the Plumb Foundation. This Scheme is therefore clearly in line with the multi-institutional initiatives and government strategy to enable more people into farming.

v) Agricultural workers and farmers worldwide have historically lived on the land on which they work. Given the high physical labour demands and long hours required for sustainable agriculture, there is no good reason why they should not continue to do so, and if they are prevented from doing so then this will decrease effectiveness. On the other hand, this Scheme could set an enlightened precedent for further temporary dwellings as will be required if the UK is to avoid a food security crisis in the future.

Appendices

Appendix JW/1. Global technical mitigation potential by 2030 of each agricultural management practice showing the impacts of each practice on GHG

Appendix JW/2 Mitigation activities to increase carbon sinks, reduce energy use and avoid GHG emissions (based on Pretty, 2008; Bellarby et al, 2009)