Report of a seminar

held October 2009, Fordingbridge

by Flora locale
and the British Ecological Society Agricultural Ecology Special Interest Group

Edited by Dr Barbara Smith and Sue Everett MIEEM

Contents

Flora locale
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The British Ecological Society Agricultural Ecology Special Interest Group
The group is forum for exchange of information between ecologists, conservationists and policy makers. It is concerned with conservation in the farmed landscape, using ecological theory to address agricultural problems, economic and ecological sustainability of current farming systems and the implication of agricultural policies. This is done through meetings, workshops, field visits, an email bulletin board and contact with other societies.

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1. Introduction

There is immense pressure on the horizon through climate change. The UK is likely to remain suitable for agricultural production when much of the world will not. Farming systems will need to be resilient, flexible and diverse. This is in contrast to post-war change, and the continuing situation where farming systems have become increasingly simple, reflected in significant declines in wild flora and fauna as well as pressure on the natural resources upon which everyone depends, including air, water and soil. At the same time, farming is suffering from an ageing and declining (in number) rural workforce. It is also highly fossil-fuel dependent, and contributes to an estimated 23% of the UK's greenhouse gas emissions.

Consequently, there are currently many debates about the future of farming, of which this report reflects just one.

This report is very much the reflection of open discussion with little editing. The Editors', in conjunction with some other contributors to the meeting, intend to consider the output from the meeting and produce a 'future farming' policy and research comment paper. This will be issued more widely as a contribution to the ongoing debate about the future of farming, and its place in providing a healthy and biodiverse environment as well as sustainably produced, healthy food.

1.1 Aims and rationale

Given the increasing pressure on land for food production and other activities associated with an increasing population, biodiversity and natural areas are under pressure. However, society must deliver a future landscape able to fulfil the basic requirements for appropriate levels of food production as well as good human health and a healthy ecosystem. Our current approach to this challenge is fragmented, in terms of policy, research and practice. If we continue with the current model of land use, we are unlikely to deliver the above.

This seminar aimed to explore how the pressure to increase food production can be balanced with the need to maintain and restore farmland biodiversity. Inevitably some of the wider environmental and social aspects were touched upon both in the plenary and workshop sessions.

1.2 Presenters and format

The seminar was introduced by Barbara Smith (Director, Flora locale and Secretary, British Ecological Society Agro-ecology Specialist Group) and Sue Everett, Technical Adviser to Flora locale, with an opening presentation from Poul Christensen, Acting Chairman of Natural England.

Scene-setting presentations followed:

> Professor Tim Benton, Leeds University, Biol. Sci.: Land sparing v land sharing
>
> Professor Henry Buller, University of Exeter: Integrating biodiversity and food production - the role of livestock
>
> David Burgess, The Wildlife Trusts: Can we conserve the building blocks of biodiversity on farmland?

Simon Fairlie, Director of Chapter 7[1]: Could Britain feed itself in 2050 – a scenario.[2]

Robert Sutcliffe, farmer & Director, Flora locale: A farmer's perspective

Patrick Whitefield[3], leading permaculturist: Future possibilities for improving crop and farm diversity

Ian Pickard, Department for Environment, Food and Rural Affairs: the current policy climate.

Selected Power Point presentations have been uploaded onto the Flora locale website.

In the afternoon, delegates were split into four groups with each group participating in two out of four workshops:

Fossil-free future farms: Practicalities and implications for biodiversity (led by Caroline Drummond, LEAF

Sustainable livestock production and its role in restoring and conserving biodiversity in the farmed landscape: led by David Burton (Natural England and Director, Flora locale)

Wildlife habitat in the future farmed landscape: needs, scenarios and practicalities: led by Roger Wardle, farming and wildlife consultant

Options for improving crop diversity and diversifying production methods; how can ecological principles be applied to sustain productive farming: led by Dr Chris Stoate, Game and Wildlife Conservation Trust

2. Summary of the workshop discussions

This section comprises notes from the workshop discussions, and acts as a reflection of the debates with some added editorial comments. Some of the activities mentioned are already beginning to appear in Government policy (e.g. encouragement for on-farm biomass and renewable energy) or are subject to research and development, while others provide pointers for future research or policy.

Points raised by debates in the workshops are not prioritised.

2.1 WORKSHOP 1: Fossil-free future farms

Part of the pressure on the management of biodiversity and semi-natural habitats is brought about by climate change, use and misuse of our natural environment and society's dependency on fossil fuels. This high use of non-renewable fuels is unsustainable. Our challenge is to reduce this dependency and create a low carbon farming approach, but what approaches and changes are needed?

2.1.1 Energy

There are **opportunities to use renewable energy** on farms and the importance of **on-farm energy production** was emphasised by several of delegates. Examples include:

The replacement of some carbon based fuels **with bio-fuels,** providing these did not displace food crops or land of high wildlife value.

[1] ,the planning arm of The Land Is Ours network which campaigns for '... access to land for all households... through environmentally sound planning'. Simon is also the co-editor of *The Land* magazine, formerly Chapter 7 News

[2] See http://transitionculture.org/2007/12/20/can-britain-feed-itself/

[3] www.patrickwhitefield.co.uk

The adoption of alternative technologies **such as wind** (with the caveat that energy production will be sufficient from each unit) and **solar power, especially passive systems for heating water, etc.**
On mixed farms, **methane from animals to be used as fuel**
Anaerobic digestion has great potential, especially for food and mixed waste but **not if it depends on specifically grown crops** which will require both land and management.
Composting farm waste to replace peat (which locks carbon effectively) in horticulture would go some way to conserving biodiversity in the peatlands.
Short rotation coppice, farm woodlands and hedgerows are **useful sources of wood-fuel.**
Managed woodland is does not only provide fuel but **supports high biodiversity** due to a heterogeneous structure and a variety of light levels.
In some sectors, notably in the lifestyle farming sector, there is some effort to reduce reliance on motorised transport by **returning to horse-power** and this is something which should not be dismissed out of hand and, although not practical for large intensive holdings, could be employed on smaller units and for specific tasks such as in woodlands where vehicles can cause significant soil damage.

It will be important to **audit energy use on farms; farmers need to be supported** to **reduce energy use** where necessary (NB the Government has recently announced loans for this)

Increased reslience will be offered by utilising a diversity of energy sources.

Minimum tillage can dramatically reduce machinery passes and hence fuel use. Editors' comment: however there are also disadvantages to min-till, e.g. weed build-up, necessitating greater use of herbicides (although alternative approaches such as a winter green manure have been successfully used).

2.1.2 Permaculture

Minimum tillage emerged from **permaculture**, which is an approach to designing human settlements and perennial agricultural systems that aims to mimic ecological relationships in natural systems. Typically a permaculture plot will combine animal husbandry with a diverse array of crops and uses low inputs; **it is inherently low carbon farming and elements of the system may be transferable to mainstream** agriculture. For example perennial cropping could be adopted (such perennial wheat).

2.1.3 Soil restoration

Editors' comments:

Arable land, excluding organic and other low input systems, is suffering from loss of soil carbon and soil biodiversity, with the consequence that soil biological function has been lost. This has serious consequences for nutrient cycling. Much arable land is now fully dependent upon receiving nutrients in the form of artificial fertiliser leaving farming vulnerable to shortages and price increases. Production, transport and use of N fertiliser rely on a high input of fossil fuels, so approaches requiring less artificial N inputs will be needed. Restoring the ability of soils to cycle and mobilise nutrients is one option needing to be considered.

A recent study indicates that carbon in soils under organic farming is significantly (at least 28%) greater than under conventional farming dependent on chemical inputs. Authors of this study suggest that organic

farming, through restoring soil carbon, has the potential to reduce the UK's greenhouse gas emissions from agriculture by at least 23%.[4]

Options to restore soils include:

Restoring **mixed farming systems and associated crop rotations**, which can reduce reliance on artificial nitrogen inputs and reduce pest buildup associated with continuous cropping.

Use of alternative **biosolids** (other than farmyard manure) **as fertilizer**. [sewage sludge is already used on some farms, where it is available]. Editors' note: however the ability of arable soils to hold and cycle nutrients in applied organic matter is likely to be limited by the soil organisms present that are needed to provide this 'service'. In reality, soil carbon in arable soils which do receive organic matter, but continue to be chemically farmed, remains very low (e.g. one case study measured an average of 1.5% OM[5]). Continuing chemical inputs prevent recolonisation by the full range of soil flora/fauna that may be considered optimal.

Well managed extensive grazing systems and rotationally grazed farms can **increase carbon storage** in soils.

Diversifying pasture by introducing a variety of grasses and herbaceous species **increases biodiversity, soil stability, nutrient cycling** and should enhance the potential for **carbon sequestration.**

Chemical nitrogen additions can be reduced by using legumes in grassland and rotations. Editors' note: Traditionally this was achieved using clover leys, often undersown with a cereal crop – a technique which is already used on organic farms and others wishing to reduce reliance on artifical N inputs.

Editors' comment: **Reintroducing beneficial soil flora and fauna** (e.g. mycorrhizal and beneficial fungi, earthworms) is a practice worthy of further investigation, and is already used on some biodynamic farms and on some unfarmed estates (e.g. Harvard University).

Research has shown that **minimum tillage** (reducing cultivation depth and soil disturbance) **is beneficial in terms of retaining nutrients, soil biodiversity and reduces carbon loss from soil.**

2.1.4 Technology

Precision farming is used, largely in conventional farming, to target fertilizer and pesticides application; it this way it minimizes inputs and should be encouraged by government. **The value of this approach could be extended to herbicides and improved to make it more accessible**. Editors' note: However, it is most appropriate for larger fields and unlikely to be a cost-effective technique on all farms.

2.1.5 Economic levers

Economic levers can be useful to incentivise practices that would otherwise not be widely taken up. Suggestions included:

A tax on artificial nitrogen

Carbon accounting for farming. Editors' note: a carbon calculator is already available from the CLA)

Limited carbon trading. Editors' note: however, experience with the existing international carbon trading schemes have exposed significant weaknesses in this approach.

[4] Azeez, G. 2009. Soil carbon and organic farming. Pub. Soil Association.

[5] Reported by Peter Melchett, 2009 at the Soil Association Conference from a study of a conventional farm on similar soils adjacent to his own organic Norfolk farm.

Food to table valuation of supply chain to identify weaknesses and opportunities for savings.
Auditing energy use on farms and **support farmers** to **reduce energy use** where necessary.

2.1.6 Social considerations

There is a need to **educate the general public in order to re-connect people with their environment**. This needs to take place across society and should not be restricted to a relatively small demographic group. Small initiatives already exist (e.g. rural gyms for urban people) but they are not widely available.
In the same way, there needs to be a **change in societal culture among the farming community so that changes likely to deliver environmental benefits are adopted willingly and speedily**.
Farming is almost completely mechanised and **few people have rural skills**, there are **possibilities for more people to be employed on the land** and mechanisms should be should be explored for achieving this.

Editors' comments:

However, many people are unwilling to do farm work owing the low pay, hard work and difficult conditions. Hence although there are many jobs available, it is difficult to fill them from the indigenous population.
Furthermore, **many rural areas suffer from acute housing deprivation exacerbated by restrictive planning policies, the high cost of land and property, and antagonism over new houses** in rural areas. Some of the most affluent counties in England also have considerable social inequality.

2.1.7 Wild food

There is scope for **improving utilisation of wild food and game**. This would also benefit biodiversity, e.g. by reducing deer-browsing in woodlands.

2.1.8 Priorities for Research and Development

Improvement of current renewable energy technology
Development of new renewable energy sources including the technology to store energy once it is produced
Specifically, **research into biofuel production** – including second generation bio-fuels that use whole plant and fermentation to produce ethanol.
Development of farm vehicles that run on alternative energy, e.g. electricity, in tandem with on-farm energy production.
To **investigate the extent which native species (plants) and traditional breeds are better adapted** and therefore require **less in puts.**
Selecting breeding for tolerance to a range of conditions (livestock and crops).
Breed for increased lifespan and **dual purpose** animals e.g. shorthorn cows; table/egg poultry bred for natural forage based diet
Research into **foodstuffs for livestock that can reduce GHG emissions**
Investigate new/old strains of crops more suited to low input farming
More research into N-fixing crops and into the benefit of combining crops.
Investigate the **benefit of bi- and multi-species cropping** (known as 'polyculture') on a permanent basis, i.e. growing more than one crop in a single field, **or mixing cropping with livestock** – the **approach of permaculture and agroforestry** (e.g. chicken/sheep/orchards)

Investigate the potential for different types of crop to be grown as food for people – e.g. pulses and nuts for protein.

There is potential to reduce other GHGs such as methane and nitrous oxides by **improving drainage and introducing slurry injection** (better storage) – but more research is necessary.

Develop selective hoes for weed/crop differentiation (to reduce reliance on herbicides) – the organic movement is already leading on this to some extent

There is potential for using genetic modification to develop crops, especially in terms of disease-resistant varieties and N-fixing crops (e.g. wheat) but **these will only be taken on board if concerns relating to safety, control and ownership concerns are meaningfully addressed**

Investigate methods that can restore a biologically functional soil and reduce reliance on chemical inputs.

2.2 WORKSHOP 2: Sustainable livestock production and its role on restoring and conserving biodiversity in the farmed landscape

The following points reflect discussions related to livestock farming throughout the UK, whether in the lowlands or marginal upland areas. Although the latter remain predominantly under livestock farming, similar pressures apply, notably costs, low income and socio-economic changes, although marginal areas have less access to niche markets.

Mixed arable and livestock farms are associated with high biodiversity, partly because a diverse fauna is encouraged by livestock and partly because mixed farms necessarily lead to heterogeneous landscape. Furthermore, some semi-natural habitats, such as diverse grasslands, are reliant on grazing animals for their maintenance. As small-scale livestock farming becomes progressively less profitable, it is increasingly difficult to source grazing animals and many previously diverse grasslands are falling into disrepair. This workshop considered possible solutions and policy priorities for integrating sustainable livestock production with the restoration and conservation of biodiversity in the farmed landscape.

2.2.1 Opportunities

Reduced carbon emissions associated with transporting food by increasing the quantity of locally produced and processed food consumed.

Reduced reliance on chemical inputs, improve soil carbon and biodiversity, reduce pest build up through introducing grassland-arable rotations in arable heartlands.

Niche markets. Editors' note: There are inherent conflicts in needing to provide affordable food versus creating high value niche markets serving a small but affluent sector of the population. Furthermore, niche markets are concentrated in towns, often away from the main centres of grassland farming. For these reasons, we do not believe that a focus on serving such niche markets is likely to be achievable or sustainable in many situations.

Increased biodiversity on farmland by expanding extensive mixed farming systems.

Increased diversification of farming systems. Editors' note: currently the trend is for increased specialisation and simplication of farms.

Provision of ecosystem services.

Access to paid conservation grazing.

Financial rewards to farmers perhaps through creating a market in biodiversity and ecosystem services.

Working at a larger (e.g. landscape) scale or with groups of holdings.

Reduce the adverse environmental impacts of farming overseas. E.g. by environmental accounting for agricultural products (see below).

2.2.2 Mechanisms and approaches

Improve the attractiveness of agri-environment schemes to increase participation**.** The schemes should incentivise traditional mixed and extensive farming (Editors' note: they already do to a considerable extent).

Better practice among commodity-led farmers could be achieved through **group HLS agreements.** Incentives should be balanced with regulation in the form of **N tax, tighter cross compliance rules and an insistence on activities most appropriate to lowlands**.

Land reform.

Introduce simple changes in farm management to intensive farms: e.g. rotational grazing, late cut silage and an increase in the proportion of hay production[6].

Incentivise grass-based system: e.g. introduce a Protein feed tax. Editors' note: would this be on imported proteins rather than those grown on the farm? Reducing reliance on imported protein could also reduce 'outsourced' greenhouse gas emissions associated with long distance transport of feed and conversion of forests overseas to soya farms. Such a tax would not be allowed under the WTO rules. Although introduction of carbon rationing might be another approach this would also require international agreement.

Collaboration with conservation land use e.g. grazing and keeping dual purpose cattle breeds.

Funding made available via **carbon credits** (to fund grazing projects).

Local food distribution and production for local markets with quality branding.

Ban buy one get one free.

Encourage less consumption of meat. This would reduce demand and theoretically allow less intensive farming. Editors' note: this is a complex subject. E.g. Less consumption of meat produced using high protein feed (soya, cereals) may offer most potential for extensifying land, but there will be other competing pressures (e.g. use of land for biofuel/biomass cropping) as we as international trade issues.

Reduce waste associated with food production and marketing. Editors' note: if significantly reduced this would negate the call seeking to produce more food from the same area of land as at present, and has been identified as requiring action by Government.

Farmers should be **transparent and educate** people about what they are growing.

Identify some **large farmers as exemplars of best practice**.

Encourage **new entrants with different mindset**.

Precision farming type technology applied **to livestock systems** e.g. precision farming to reduce inputs and increase yields.

Account for the environmental impact of food products, and introduce a scale of charges according to the impact. This would incentivise farming systems that produced food most sustainably (e.g. in relation to biodiversity, soil, water, carbon).

2.2.3 Barriers to change

Barriers to achieving farming systems where sustainable livestock production is integrated with objectives for increasing biodiversity include:

[6] however, hay-making is a carbon-hungry activity!

Land

Land availability and price of land are major barriers. Farm size is becoming polarised. There is a tendency for farms to amalgamate or for a farmhouse to be sold with one or two fields at a high price. The larger farms tend to become more intensive while the paddocks are often used as garden extensions or for pony-grazing. Loss of 'medium' sized farms means that gaining access to land for farming by new farmers is increasingly difficult. Council farms are also being sold.

Land is also **being taken out of production**, e.g **for development or equestrian use.**

There is a **lack of political will to tackle the need to consider land reform** (in Scotland land reform has improved access to land for crafting and community purchase). **A review could identify ways to improve access to land for farming by more people and increase the labour pool available to farm**.

Livestock and management of livestock

There is a shortage of animals of appropriate livestock breeds, e.g. traditional breeds suited to low-input systems and conservation grazing, and a lack of diversity in livestock.

Moving livestock is increasingly problematical, e.g. some farmers now unwilling to graze commons as their stock is forced to graze with that owned by others and that may carry disease.

Conflicts in intensive systems between animal welfare needs (e.g. treatment with chemical anthelmintics) **and biodiversity**.

Cost

Preventing and dealing with the consequences of animal diseases (e.g. bluetongue, BTb) are becoming **increasingly costly.** Increasing costs are also associated with disposing of dead stock, tagging and passporting.

Capital expenditure is required to restructure, e.g. where livestock farming is to be restored or where cattle are needed for upland grazing in areas taken over by sheep in recent decades.

The financial rewards are considered insufficient. The market for conservation grade livestock is undeveloped and farmers are under pressure from supermarkets to keep prices low.

The cost of labour is high for those paying, while rural pay is low for those receiving and living in rural areas is expensive.

In marginal areas the productivity and thus income is lower, while production and transport is more expensive.

In many situations, **the financial costs of livestock farming make it unviable** in business terms.

The direction of policy and funding under the CAP still favours intensive farming systems, locking farmers into industrial production. Editors' note: a plan has recently (Feb 2010) been announced to establish the UK's largest dairy farm of 8,100 cows in Lincolnshire.

Farming remains industry led and driven by industrial mentality (i.e. industrial farming approaches). This continues to be reinforced by government thinking and policy (e.g. Farming Futures).

Infrastructure

There is a **shortage of abbatoirs**. Distance to abbatoirs is correspondingly greater in marginal areas.

Many lowland farms **no longer have the labour, buildings, infrastructure or equipment to manage livestock or a livestock enterprise**.

Social

Managing livestock is considered hard, low paid work, and young people are unwilling to do it (see above). **There is a lack of affordable housing in many rural areas. The farming population is ageing and there is a loss of traditional farming knowledge and expertise.**

The rural skills base is lacking (agriculture especially livestock) and there poor mechanisms for disseminating good practice.

There is a schism between food production/marketing and land stewardship and a culture that resists change. **Society's general expectation that food should be cheap limits the market for high quality food that is more sustainably produced than under some intensive farming systems and larger units where economies of scale apply.**

Trade

Global trade prohibits protectionism approaches that could incentivies production and consumption of locally produced food to high environmental and animal welfare standards.

2.2.4 Priorities for R&D

There is a **lack of practical and scientific knowledge by policy makers** which needs to be addressed.

Education: There is a gap in the public knowledge about food, valuing food, buying local food and knowing what is in season. **What are the levers likely to raise interest and convince people**? Editors' note: the Food for Life programme (www.foodforlife.org.uk) is successfully demonstrating one approach.

The potential for alternative agro-ecological farming systems need to be investigated. For example, could **permaculture feed Britain**? Editors' note: there are claims, and some evidence, that polyculture systems if practised in the UK, could produce more than four times the quantity of food (in terms of nutritional value) than a similar area of land under a conventionally-produced cereal monoculture. However, there exist significant social, infrastructural and institutional barriers to developing polyculture in Britian.

Develop **knowledge share between conventional and permaculture and organic farming systems** about the benefits of the various systems for biodiversity.

Carry out full lifecycle analyses for different farming systems.

Identify relationships between different farming systems, their environmental impact and human health. See also 'environmental accounting under 2.2.2.

Agri-environment schemes: What is the relationship between biodiversity success in terms of NE ELS and HLS and landscape connectivity. **Need to look at the AES at the landscape scale** to ensure/see how to join up habitat for wildlife to make it effective. Editors' note: the targeting approach aims to improve the outcome of schemes at a landscape scale and for wider benefits, e.g. water resource protection in Priority Catchments.

Some of these areas are currently subject to research but may benefit from the Flora locale type 'advisory' notes, to provide simple guidelines for farmers to follow:

Growing livestock feed on the farm
Rotational grazing, mob grazing
Undersown legumes and green manures
Nutritional benefits of grazing biodiverse swards
System studies at whole farm/landscape scale
Plant community scenarios in terms of climate change/invertebrates/host plants/crop production
Animal husbandry on marginal land
Animal health and welfare policy – relationships to biodiversity
Benefits and disadvantages between silage and hay production (including carbon cost, biodiversity benefits, soil carbon)
Contingent valuation studies that cost the value farming puts into conservation.

Do we know how much food goes abroad to be replaced with similar imports? Editors' note: yes.

How livestock products can be given a value, and marketed, according to the biodiversity and resource benefits associated with the system under which they are produced?

Provide information showing how '**lifestyle' landowners can produce food economically**.

2.3 WORKSHOP 3: Wildlife habitat in the future farmed landscape

2.3 1 Rationale

'Wildlife habitat' (i.e. land that is managed for wild species) will be under increasing pressure as the need to increase food production becomes more urgent. However, small patches of wildlife habitat may not be sufficient to maintain viable populations and it may be necessary to increase the area of uncropped land. Whether wildlife can be usefully integrated into the farmed landscape or whether we need to focus on increasing reserve size has not been fully explored. In this workshop the needs, scenarios and practicalities for maintaining and restoring wild habitat in the future-farmed landscape were discussed. A significant area of the debate concerned the role of agri-environment schemes.

2.3.2 Agri-environment schemes

The agri-environment schemes are of pivotal importance in maintaining and recovering biodiversity in the farmed landscape. They must be improved, and strongly defended to ensure they survive and are improved post 2013. **The schemes, are still evolving, can and should be improved. They are popular with farmers – particularly Higher Level Stewardship is very popular**. The benefits are:

When farmers see agri-environment schemes delivering benefits, they take pride in their ownership.

There advantages in showing trust and flexibility in scheme implementation at the farm scale, which Natural England recognises.

However there are also concerns:

Conservation headlands have not been adequately taken up as there is a higher payment for grass margins. Editors' note: we also need to recognise the contribution grass margins make to carbon sequestration and reducing fossil fuel use. These will be greater than for cultivated margins. This is a case of where there are trade-offs between achieving biodiversity benefits v natural resource protection.

HLS agreements are too complicated. A 'nature reserve' type management plan on top of the agreement would provide a much clearer overview, i.e. set out aims, objectives, describe what is important and allow for workplans. This approach would be especially useful for land holdings owned and managed by groups of individuals and those where SSSIs are present.

There is long term inflexibility and inertia in the schemes owing to having to obtain EU approval for changes. This was **seen by some as a barrier** (schemes are unable to adapt to changing needs) but **also as a benefit**, in providing stability, including guaranteed levels of payment. One suggestion was that the **EU should set a framework and criteria, within which Member States design the detail of their schemes** and would not have to seek approval for the detail.

ELS: farmers choose the simplest options which often have least biodiversity benefit. Their choice is drive by the financial rewards and costs. To change this requires improving the schemes and paying more for the options which make most difference.

Post 2013: could something be done to incorporate reporting into Single Farm Payment returns? There need to be indicators of success.

Can we do better in terms of applying payments, e.g apply a:

reward on achievement - pay a bonus on delivering a successful outcome?

Penalty, such as compulsory set-aside, for non-compliance

2.3 3 Ecosystem services and accounting

Biodiversity and resource protection e.g. (soil, water, woodlands for fuel), **as well as other societal benefits, need to be considered and valued in an integrated way**. This must be a two-way approach; for example, farming, flood protection, and energy policies must be aligned with maintaining and restoring biodiversity.

It is vital to ensure the externalised costs of farming are fully accounted for and that the public and the farming industry understand what these are and who has to pay for them whether in the short, medium or long term. Techniques for this are well established (e.g. see CSERGE[7])

This **requires education and awareness-raising among the public and politicians** in order they commit to supporting sustainable farming within which biodiversity and resource protection are integrated, and externalised costs substantially reduced.

[7] The Centre for Social and Economic Research on the Global Environment.

2.3.4 What is farming?

There is a **need to adequately define what farming is**: It is not just food production, exploitation of land for profit or a means to maintain income for an individual, family or other business (although these are the factors currently dictating how the majority of land is farmed). Editors' note: this could be the subject of a survey through the farming and conservation press.

2.3.5 The price of food

Food needs to be realistically priced to make sustainable farming viable.

2.3.6 Approaches

A permaculture approach would weave a **mosaic** of habitats into the farmed landscape and would increase biodiversity at all scales (assuming existing semi-natural habitats were retained), as the current 'monoculture' approach to farming would probably be replaced by smaller fields containing a much greater diversity of crops.

Franz Vera's approach of landscape-scale habitats extensively grazed would perhaps be the approach for some landscape areas that are currently dominated by livestock farming, or for large areas of wetlands such as those being restored under the Wetland Vision.

If hedgerows in poor condition are replaced with new hedgerows, these will be costly to manage and any will no longer have a traditional function. Replacing them with woodfuel strips would mark a different direction, but could have dual benefits for biodiversity and at the same time provide a rewewable source of energy. (An example of how landscapes may need to adapt and change). Alternatively, if mixed farming is set to return to arable landscapes, is it likely, in the long term, that the traditional function of hedgerows (to exclude livestock) could be restored?

Less simplicity and more diversity in all senses is needed to benefit biodiversity and will have other societal benefits.

Different strategies are needed for different landscapes, such as the uplands, lowland arable and lowland grass-dominant ones **and for different scales**, i.e. farm, landscape

The ultimate aim would be for a **sustainable, integrated approach**.

In the short term, a land sparing approach will be essential to maintain core biodiversity elements (species, habitats).

The added value of biodiversity needs to be fully recognised, e.g. cultivated margins can be good for arable weeds that benefit game birds.

It is vital farming **caters for specialist species and habitats and that care for these special features is integrated into farming activity.**

Policies on resource protection need to be more aligned and integrated.

Currently we are 'tinkering'.

Connectivity is on the agri-environment agenda. The Wildlife Trust's Living Landscapes initiative is beginning to achieve connectivity in local landscapes and between different stakeholders, including farmers.

2.3.7 Tools and mechanisms

The following were identified:

Money (incetivisation, penalisation – carrots and sticks)
Regulation

Pride, achievement, sense of belonging in a group – if everyone else is doing it individuals won't feel left out (e.g. organic farms tend to be clustered).

2.3.8 Priorities for R&D

Community supported agriculture
New integrated farming systems using **agro-ecological approaches**.

2.5 WORKSHOP 4: Crop diversity and diversifying production methods

"Agricultural ecosystems rich in biodiversity provide a diversity of foods that can increase food security and improve nutrition by broadening the food base and diversifying diets. Diverse diets can contribute to the fight against malnutrition, obesity and other health problems in both developing and developed countries. Even within a particular crop, nutrient contents vary significantly between varieties."

Ahmed Djoghlaf, Executive Secretary, Convention on Biological Diversity. Montreal, 15 October 2009

2.5.1 Rationale

There is only a certain amount of land that is suitable for current methods of food production. Given the increased pressure on land for energy crops, it may be necessary to consider diversifying food and fibre production methods or to consider growing new crops over the coming decades. Recently, fears have centred on the loss of crop genetic diversity and the implications for food security (Esquinas-Alcazar, 2005)[8] and the importance of non-cropped habitats on farmland for biodiversity. However the potential benefit of diversifying crop types and production methods for both food security and biodiversity is poorly explored in scientific journals. In this workshop the group discussed potential new crops and production methods, associated biodiversity benefits, the barriers to uptake, educational and R&D needs and policy issues.

2.5.2 Alternative crops and methods

Editors' comment: By 'alternative' we mean plant species that are currently not widely grown, or consumed as a major part of our diet, in the British Isles. Examples include perennial wheat, nuts and legumes grown specifically for human consumption (not for livestock feed) as well as crops having multiple purposes, such as plants grown as green manures that produce flowers (nectar for insects) and can be used as livestock fodder.

Alternative biofuel crops: Brassicas, opium poppy, hops, perennial rye-grass, cotton, hemp, flax,
Alternative production methods: **There should be biodiversity benefits associated with moving away from the current monoculture approach and growing a much larger variety of plants as food for people**.
Adopting permaculture principals such as inter –cropping and bi-cropping, exploiting niche differentiation in ecosystems (niche cropping), multi-strain plantings would **increase biodiversity and also be a useful for climate change mitigation**.
Minimum tillage protects soil structure and biodiversity while retaining nutrients and carbon.
Editors' note: however, min-till does not allow for carbon to be incorporated into the lower part of the soil profile, a concern of organic farming.

[8] Esquinas-Alcazar, J. (2005) Protecting crop genetic diversity for food security: political, ethical and technical challenges. *Nature Reviews Genetics* **6**, 946-953.

Better use of existing woodland e.g. coppicing **would benefit wildlife, provide fuel and also help historical woodland vegetation**. Previously coppiced woodland is an overlooked source of biofuel. There may be **biodiversity benefits associated with short-rotation coppice**, depending on its location (e.g. see www.relu.biomass.org.uk).

Extend and improve precision agriculture.

Use **green manure** as an alternative fertiliser.

Use native seeds and plugs for grassland restoration schemes to ensure that well adapted genetic diversity is maintained.

Crop breeding will benefit from biotechnology (caveats regarding control and ownership of biotech products apply)

2.5.3 Biodiversity benefits

Introducing **alternative crops** should **increase spatial and temporal crop diversity**. Editors' note: this will depend on how and where they are grown. A few new crops grown as monocultures is not what was in mind when this point was made.

Overall landscape enhancement will **increase landscape permeability and may help wildlife adapt to climate change**

GM crops may advantage wildlife as **new crops could require fewer inputs**. However this is balanced by the **unknown effects of new GM crops and potential for wide-scale monoculture planting**.

Maintaining native species is important as this may have **an effect on higher trophic levels**.

Mixed farms (low carbon) encourage biodiversity. Different rotations and the boundaries alongside **new crops** may encourage beneficial insects that act as **natural pest control.**

2.5.4 Barriers

Resistance to change – from three main sources: **Societal and scientific community attitudes to alternative methods of farming** (seen as naïve); **farmers and land managers** preferring to stay with tried and tested methods (**conservative – traditional**); **the public** do not understand farming and **are nervous of supporting big changes**. There is also a tendency to adopt short time horizons (we should be planning now for 2050), as changes are adopted cautiously and the effects are slow to see.

Infrastructure: the machinery to sow cultivate, harvest and process multiple crops is not available (high capital cost for adoption of alternative crops).

CAP is inflexible

'**Profit driven culture fuels 'tragedy of the commons'**

Land tenure and tax incentives stifle innovation and enterprise.

2.5.5 Education

A public relations exercise to show the public the benefits of sustainable farming may persuade public to pay realistic prices. Editors' note: this is unlikely. Products farmed sustainably are only likely to be taken up by mainstream consumers if food produced unsustainably reflects its true cost to society (e.g. environmental impacts) and becomes more expensive. Or if it is shown that food produced unsustainably damages human health (unlikely).

A public relations exercise to improve public perception of agricultural industry – **link agriculture to biodiversity and amenity values.**

It is necessary to **encourage more diverse eating habits** ; this can be achieved through schools and public education
Independent advisors (FWAG) can translate research outcomes onto farms
Science entrepreneurship in schools and universities will **encourage innovation**.

2.5.6 Priorities for R&D

In general there is a **lack of agricultural research and funding**; reinstating the government research station would be one way of making sure pertinent research is carried out. There also needs to be **more prominent and peer-reviewed research on alternative crops including permaculture techniques and the quantitative effects on biodiversity.**

The most important areas to be investigated are:

How to maximise productivity (crop yields, biofuel production etc.) under sustainable farming (low carbon, high biodiversity, etc) scenarios
New production methods and biodiversity friendly management
How to integrate novel crops into the landscape;
the carbon cycle of new crops and different cropping methods. There are biodiversity implications for different mosaics of different crops – possible benefits of policies to maximise or to promote particular crop types
More research into multi-objective benefits of certain crops – does it differ regionally?
Perennial crops (already work in USA, Land Institute, Kansas – university of Washington state) – need to adapt the work to British conditions
Low carbon ways to grow major crops
Research on legumes for Northern Europe. Better varieties, better quality. Are they useful as biofuels?
Food crops that need less water
GM crops (caveats apply)
Honeybee health – disease ,varroa control (pollinators are crucial)
Biofuels - lots of research scope for generation and efficacy
Climate / crop coupled models
Food, fuel and feed interaction
Scenario planning - global v local / fortress Britain/ degree of region specialisation

Can we refine the winners/losers under different systems / cropping patterns?

Research should be on a landscape/catchment scale (there are benefits to water quality and diffuse pollution as well as biodiversity) and this must be emphasised to stakeholders.

New approaches should be investigated: e.g. **an assessment of agroforestry as a solution to the food vs fuel crisis.** What are the transport effects on planting (?) farm to fork.
How quickly can consumers accept new foods? This will affect the value of the crop – to what extent can new foods be imposed? What are the economic pressures?

2.5.7 Policy

There is a feeling that policy makers need to understand farming better and that government should consult more widely, especially with the farming community before creating policy.

Policy is poorly integrated, for example current policy favours either forestry or agriculture with no support for a combination, e.g. agroforestry systems.

It would be useful if CAP promoted mixed cropping and was flexible enough to be adapted to local needs.

CAP should support the use of novel crops and rules (cross-compliance) and incentives for providing habitat for wildlife.

Incentives to develop and implement new crops and technologies would encourage new and younger farmers.

Suggestions of ways to get policy out on the ground effectively were:

Facilitate social groupings of farmers developing specific new crops – so they can team together support each other through change and share / manage risks.

Overcome resistance to change by better advice – a service like ADAS once was.

APPENDIX 1: List of participants

Jacky Akam	Berks,Bucks & Oxon Wildlife Trust
Sebastian Anstruther	Barlavington Estate
Judith Baker	HLF Purbeck Keystone Project
Helen Barnes	FWAG Cymru
Amanda Barton	Marquis and Lord Consultants
Prof Tim Benton	University of Leeds
Dr James Bennett	Coventry University
Robin Blake	Centre for Agri-Environmental Research, University of Reading
Susan Bragg	Hampshire County Council
Clare Buckerfield	Dorset Wildlife Trust
Prof Henry Buller	University of Exeter
David Burgess	Hampshire & Isle of Wight Wildlife Trust
David Burton	Natural England, Director & Trustee Flora locale
Kirsty Burnet	University of Sheffield
Sir Charles Burrell	Knepp Estates
Dr Simon Butler	University of Reading
Julie Button	Natural England
Sara Cadbury	New Forest Study Group
Poul Christensen CBE	Chairman, Natural England
Donna Clarke	Southampton University
Richard Clarke	Chairman, Flora locale
Sue Clarke	Flora locale
Natasha Collings	
Sean Cooch	Natural England
Lucy Cooper	The Grasslands Trust
Alison Cross	Hampshire and Isle of Wight Wildlife Trust
Tom Curtis	Landshare
Caroline Drummond	LEAF
Simon Duffield	Natural England
Malcolm Emery	Natural England
Sue Everett	Technical Adviser, Flora locale
Julie Ewald	The Game and Wildlife Conservation Trust
Simon Fairlie	Chapter 7
Lisa Ferguson	

Dr Rob Field	RSPB
Andrew Forbes	Green End Farm
Richard German	University of Leeds
Prof David Gowing	Open University
Dr Georgianne Griffiths	DEFRA
Andy Gulless	Heads Farm
Dr Jilly Hall	Natural England
Jenna Hegarty	RSPB
John Holland	The Game and Wildlife Conservation Trust
Naomi Jones	The Food and Environment Research Agency
Caroline Kelly	Butterfly Conservation Trust
Carol Lodge	Herts and Middlesex Wildlife Trust
Donald MacIntyre	Emorsgate Seeds, Director & Trustee Flora locale
Steve Markham	Marquis and Lord Consultants
Dr Jon Marshall	Marshall Agroecology Ltd
Claire McCorquodale	Flora locale
Jim McGinlay	Open University
Charles Morgan	PONT (Grazing Advice Partnership Wales)
Eleanor Newson	Grazing Advice Partnership
Emily Newton	Dorset Wildlife Trust
Helen Pengelly	Canopy Land Use
Lois Philipps	Emslie and Crocker Rural Consulting
Ian Pickford	DEFRA
Andrew Pollard	Dorset Wildlife Trust
Helen Proctor	University of Sussex
Dr Geoff Radley	Natural England
John Rattray	Wiltshire Wildlife Trust
Marian Reed	
Rebecca Ross	Parliamentary Office of Science and Technology
Dr Gavin Siriwardena	British Trust for Ornithology
Dr Barbara Smith	The Game and Wildlife Conservation Trust, Director & Trustee Flora locale
Joanne Smith	The Organic Research Centre
Dr Jenny Sneddon	Liverpool John Moors University
Dr Chris Stoate	Game and Wildlife Conservation Trust

Robert Sutcliffe OBE	Farmer , Director & Trustee Flora locale
Peter Sutton	Syngenta, Ecological Sciences
Peter Taylor	Ethos UK
Lucy Temple	Hampshire and Isle of Wight Wildlife Trust
Jo Thornton	Hampshire County Council
Adam Twine	Colleymore Farm
Sally Wallington	Consultant
Roger Wardle	Roger Wardle Consultancy
Debbie Watkins	Dorset Wildlife Trust
John Whiscombe	The Game and Wildlife Conservation Trust
Patrick Whitefield	Permaculture author
Phil Wilson	