Briefing Paper

Primrose Organic Centre energy descent and Gaia farming

At the 2007 Soil Association Conference on 'One Planet Agriculture' it became increasingly apparent that our permaculture approach to food production at Primrose provides a very successful example of energy descent farming. With global warming becoming an increasingly scary reality and 'Peak Oil' around the corner, there is an urgent priority to reduce fossil fuel inputs during the production and distribution of food.

It has been estimated that during the last 100 years 50% of the increase in carbon emissions are a result of food production. It could be considerably higher than this if the embodied energy of building the tractors and machinery, etc. is included. Certainly the carbon cost of bringing food to our plates has been estimated to be almost as much as the combined amount released through heating our homes and from running our cars (Sustain: Eating Oil; 2001). Much of the carbon emissions over the last century have occurred through organic matter being lost from the soil. The Fens in Britain and the Dust Bowl in America are two examples of this where massive losses of carbon to the atmosphere have occurred as a result of agri-business farming practices. Sadly massive subsidies have been given in Britain to support these farming methods.

Organic farming addresses carbon losses from the soil, since a primary focus is to lock up carbon in the form of organic matter to increase soil fertility. It is being suggested that this sequestration of carbon into the soil can be traded against emissions of CO2 but this is a very complex process with many variables including losses during ploughing and is impossible to quantify accurately at present. In addition, however beneficial this is to the soil, locking up carbon in the soil is not going to provide the absolute necessary reductions of emissions from fossil fuel use over the next 10 years. The only way that we can definitely reduce emissions is to both source more of our energy from renewable resources and to follow an energy descent programme in which our energy requirements are lowered.

There is confusion about the sustainability of organics since it encompasses a wide range of farming systems from very large farms that use considerable fossil fuel in both production and distribution, to small sustainable people-powered farms like Primrose that exhibit very high biodiversity and sell locally.

Primrose provides a wonderful example of great productivity on a small piece of land, since £20,000 of produce is sold annually from 1.5 acres. This area includes the 0.5-acre sustainable forest garden with around 100 varieties of fruit and nut trees. Also the range of and quantity of wildlife is massive compared with when the farm was a bare field only 20 years ago. The farm energy audit of Primrose estimates a combined figure for production and distribution as 0.04 tonnes CO2 emissions per £1,000 of produce sold. This is very low when it is estimated that 8 tonnes of CO2 are emitted in the journey from seed to plate for the average four-people household. Also at Primrose the Forest Garden, coppice woodland, willow plantations, green manures and carbon in the soil would all provide a highly valuable but unquantifiable carbon sink. The farm is presently installing solar water heating panels on the house and residential area, a wind turbine and biomass log boiler to reduce the energy footprint of the house.

Primrose is an inspiring example of energy descent food production of great abundance on a small area, that is relevant to both the rural farming situation and particularly to the predicted need for urban agriculture that will arise in order to feed our cities post 'Peak Oil'. This kind of small, sustainable people-powered farm should receive support, but Primrose is too small to receive a subsidy of any kind and has to pay £450/year to maintain organic certification. Massive grants are still being paid to large farms. A 1,000 hectare organic farm could receive perhaps in excess of £100,000 from the single farm payment plus £30,000 from the Organic grant plus very large tax relief on machinery purchase (40% the 1st year and 25% in subsequent years). It would also benefit through the economies of scale and other development grants or agri-environment grants. If the turnover from Primrose was scaled up to 1,000 hectares, it would yield around £30 million of produce/year, which is unlikely to be anywhere near that reached by these larger farms.

Thus large farms are receiving massive grants to produce much less food per acre, with high carbon emissions and perhaps concern for wildlife and the environment is not high on their agenda. According to a recent sustainable farming report, in 2003 the total income from farming in the UK was £3.2 billion, however this was supported by subsidies of £2.8 billion. This figure would probably not include the considerable benefit from tax relief for machinery purchase nor the massive costs of maintaining the considerable agricultural research institutes and advisory services etc that also support the farming industry. In addition it is estimated that food production in the UK requires an input of 10 units of energy for every one unit of energy produced. There is something seriously wrong with a system that is operating on these relationships of outputs to subsidies and energy in and out. Also, over the last 5 decades massive ecological destruction has occurred as a result of energy intensive farming practices. Countless billions have been spent at agricultural research institutes and advisory services to create this farming system we now have. If a tiny proportion of that had been spent investigating ways that farming could work within natural systems, the appearance of our land and the real success of our farming would be very different today.

The permaculture principal to observe and learn from nature is an invaluable starting point and leads to an attitude of viewing the earth and nature as our teachers. This immediately introduces a feeling of wonder and humility, which is vital if we are to create a harmonious relationship with the earth in our farming systems. The farming system at Primrose is viewed as 'Gaia Farming' because they adopt an attitude of working within the flow of giving and receiving and gratitude is an important part of the process. The land is so generous if it is treated with respect and we have an understanding that the earth is a living being of which we are a very interrelated part.

At the Soil Association conference both Vandana Shiva and Richard Heinberg strongly advocated a return of people to work the land as a vital part of an energy descent process. This would have multiple benefits, since working the land in an environment such as Primrose, which is a high biodiversity natural system, can be a very healing experience. It is unfortunate that over the last five decades the success of British farming has been gauged by the measurement of output per person and tremendous subsidies have supported a highly mechanised people-less farming system. However, many of these people are still involved in the process of food production, working instead in factories producing tractors, machinery and fertilizers or in research establishments or in offices managing the ever increasing paper work associated with this type of farming system. For the health of people and of the planet there should be support and encouragement for small sustainable and high biodiversity people-powered farms.

In 2000 Primrose Organic Centre founded the sustainable education charity the Primrose Earth Awareness Trust (PEAT), which now has its own inspiring site adjacent to the farm.

The main early focus was to connect children with organic and sustainable farming practices and to encourage them to appreciate the value and beauty of the natural world around us. PEAT has gained a reputation for being a leading provider of Education for Sustainable Development and Global Citizenship. This has occurred on the unique site, which contains a wide range of messages on sustainable living and food production on a human scale in total harmony with nature. PEAT has also facilitated the creation of a wide range of gardens in schools. Each year approximately 1,500 children have attended the experiential and hands on learning programme, and an expanding range of other audiences have visited PEAT's site.

There are now other initiatives that are being introduced to connect children with food and farms. At the same time Ministries of Education are prioritising global climate change and sustainability to be crucial components of school curriculum and PEAT is currently being approached by tertiary colleges to deliver education on sustainable food production and energy descent. Thus PEAT now has the potential to focus more fully on addressing some of these large priority global issues on climate change and energy descent and to raise awareness on local solutions. In order to expand the education programme and reach a wider range of audiences, PEAT proposes to build the 'Feast of Learning' Centre which will include eco-cabin, conference facility, field kitchen and restaurant, office and reception/shop area. This new education programme will deliver a wide range of sustainable education but using food as the learning vehicle. The audiences will include: corporates who will be encouraged to adopt greater environmental and sustainable responsibility; primary and secondary schools as part of their Education for Sustainable Development and Global Citizenship; tertiary groups with education on sustainable food and farming and carbon footprints; conference delegates on 'slow food', energy descent and sustainable building; and the general public on sustainable food and back to basics cookery and a range of other practical life skill courses.

Visitors will be taken on an holistic journey from 'Seed to Plate', raising awareness on the carbon energy footprint of foods from different farming systems and the effect of these different farming systems on the health of the planet and the health of the consumer. There are other initiatives that focus on particular aspects of food and farming, however PEAT will be totally unique as the education process will cover the whole holistic story from our innate relationship with nature to the food on our plate.

In addition there will be encouragement to make a deeper connection with nature and to appreciate the real quality and healing value of the natural world that is available when we live harmoniously with nature in our homes, work and our food growing systems. Gaia farming is practised when food, farming and the earth all co-exist together within the natural balance. If we are to avert the worst impending scenarios that are to be a result of global warming and peak oil, then considerable lifestyle changes will be necessary. People will be prepared to make sacrifices more willingly if they appreciate the great value of and our total inter-dependence with nature.

Designs for the 'Feast of Learning' Centre are near completion and represent an exemplary model of sustainable construction, the beautiful building merging harmoniously with the environment. The main centre will be earth sheltered to the north thus acting as a heat sink, with conservatories to the south for passive solar heating and a range of sustainable and natural materials in a creative form. PEAT requires many resources to realise this exciting project that has such enormous potential, so Primrose Organic Centre would welcome any offers for support and involvement.

Primrose Farm renewable energy programme
These are advice ideas from Primrose Farm's experience, however these should be used as

guidance and make your own investigations.

Solar water heating
The farm is presently installing two solar hot water heating systems, one for the main farmhouse and one for the residential area where there is an organic B&B, retreats and various courses are held. The solar water panels are the evacuated tube type, which perform better than the flat plate models. The cost for the two systems including two of 30 tube panels, two custom-made hot water cylinder tanks and pumps, controllers and pressure kits was around £2,500 + extra for pipe work. The panels on the roof were installed by farm staff, who also connected the pipework to near the hot water cylinder, but a professional plumber installed the cylinders and pumps and controllers (2 days work). The farm anticipates that the solar panels will provide most of our hot water needs for 8 months of the year.

Wind turbine
The farm is applying for planning permission for a 2 Kw turbine from Navitron. This will be on a 9-metre pole, since this is all that is allowed in the National Park. The cost of this will be about £1,500, however this does not include an inverter to put any surplus into the grid (inverters are very expensive). Without an inverter it will be necessary to have a dump e.g. immersion heaters into which unused electricity can go.

Biomass Log Boiler
There are various makes of boilers from different European countries. The farm is opting for the Vigas boiler supplied by Dunster Wood Fuels Ltd, mainly because it is the cheapest. There are more sophisticated ones for at least twice the price. It appears that the best arrangement is to have a large accumulator tank by the boiler, perhaps 1,000-1,500 litres for a 25 Kw and 2,000-2,500 for a 40 Kw boiler. The boilers are gasification and so are most efficient with fast burn at high temperatures. In spring and autumn it should only be necessary to fire the boiler every few days. A large mass of water is heated in the accumulator tank, which is very well insulated and apparently only loses something like a degree a day. The farm is installing a 25 Kw Log boiler. Pellet boilers may be more efficient and do not require firing so often but are reliant on an external process making the pellets and transport etc. If there is a local supply of timber then it would seem that a log boiler is more sustainable. A Vigas 25 Kw with a 1000L tank with a Laddomat 21 and safety valve is £3,445 plus VAT plus delivery plus commissioning. A pack for a 40 Kw boiler including 2000L tank is £4,600 plus VAT etc.

Primrose Farm energy audit

Minimal fossil fuel is used in both production and distribution
Productive area = 1.5 acres which yields £20,000/year
1 acre market garden of which 75% = raised beds and totally people powered
0.5 acre sustainable forest garden – no dig and minimal maintenance
All produce sold within 15 miles and 85% within 5 miles

A) Farm Energy Audit

1) Fuel production and embodied energy

Fuel used per year in production	Embodied energy
Max 3 gallons for rotovator	Construction of rotovator
3 gallons diesel tractor	Low as tractor 60 years old

Total: 6 gallons = 27.3 litres = 0.0764 tonnes CO2 emission	
Electricity 200 Watts for 2 months' seed propogating = 66kg CO emmissions	Use recycled fridges and freezers
General horticultural materials	Polytunnels low as > 40 years old, Tunnel covers - 1 per 18 months, Pots, trays etc

2) Fuel distribution and embodied energy

Fuel use per year in distribution	Embodied energy
58 trips and 580 miles to Hay-on-Wye	
20 trips and 720 miles to Brecon etc.	
Total: 1,300 miles = 52 gallons = 236.6 litres = 0.6861 tonnes CO2 emission	Low as car 16 years old, Plan to fit Eco-Tek CB – 26P to reduce emissions and improve performance

Total CO emissions (Production and Distribution) = 0.0414 tonnes/yr/£1,000

3) Net carbon sink produce sold

Beneficial net carbon sink
0.5 acre of woodland and willow coppice
0.5 acre of forest garden
Sequestration of carbon in the soil and green manures

B) Farmhouse Energy Audit

Processes	Future plans
0.5-acre woodland to source wood for heat and willow coppicing	Wind turbine—in process
Firewood bundles from local saw mill	Solar water heating—in process
Efficient wood burners	Wood boiler—in process
Low energy light bulbs, Electricity from green energy company	Conservatory on south of house
Recycle waste	Straw bale and earth constructions

Contact: Dr Paul Benham, Facilitator Farmer of Primrose Organic Centre, Project Director of Primrose Earth Awareness Trust, info@primrosetrust.org.uk, www.primrosetrust.org.uk

Soil Association
Trade and producer support team
South Plaza, Marlborough Street,
Bristol BS1 3NX
T 0117 914 2400
F 0117 314 5001
E ff@soilassociation.org
W www.soilassociation.org/foodandfarming