Zero fossil Energy Farming (ZEF)

feeding the future on a low-carbon budget

Commonwork – a low-carbon roadmap to 2050?

How can Commonwork rethink the way the agricultural industry produces and distributes food in order to achieve high quality, organic produce and at the same time bring about a significant step-change reduction in environmental impact by reducing its dependence on fossil fuel?

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The situation now

Demand for energy, transport and urban infrastructure continues to rise. The availability of fossil fuel and other resources is falling. The logistics do not stack up. In addition, this increasing demand for resources is causing an increasing output of CO_2 into the atmosphere. To resolve the situation, and give the UK a fighting chance of meeting its government targets of a 60% reduction in CO_2 by 2050, we need dramatic change.

Commonwork

Commonwork is a group of organisations working towards sustainable solutions in farming, the environment and education. It was set up in 1976 as an exploration of living and working sustainably, recognising the interconnectedness of everything and everyone. Commonwork recognises now, more than ever, the importance of this vision and is looking towards a future of reduced environmental impact.

Over the past year Commonwork has explored this with colleagues in farming, education and sustainable development. This has involved inspirational visits to ZEDfactory, responsible for the only existing zero fossil energy housing development in the UK. Commonwork's energy eco-footprint has been measured[1] and discussions held with renewable energy agencies, local authorities, DTI and Defra officers. In November 2005, Commonwork hosted an 'Energy and Emissions' seminar[2] for the pioneering Organic Systems Development Group of Elm Farm Research Centre.

We recognise the significance of the whole food and farming system, especially food distribution and transport, in contributing to greenhouse gas emissions. All developments, construction and regeneration undertaken today will have to function and succeed in a very different low-carbon future. A simple plan or roadmap for Commonwork and its farm is needed now, to guide research into farming practices and to design approaches and standards that will work best in 2050, with future technological advances anticipated where possible.

Figure 1: Showing the increasing imbalance between UK lifestyle demands and the means to meet them. A radical change is needed to re-balance the situation.

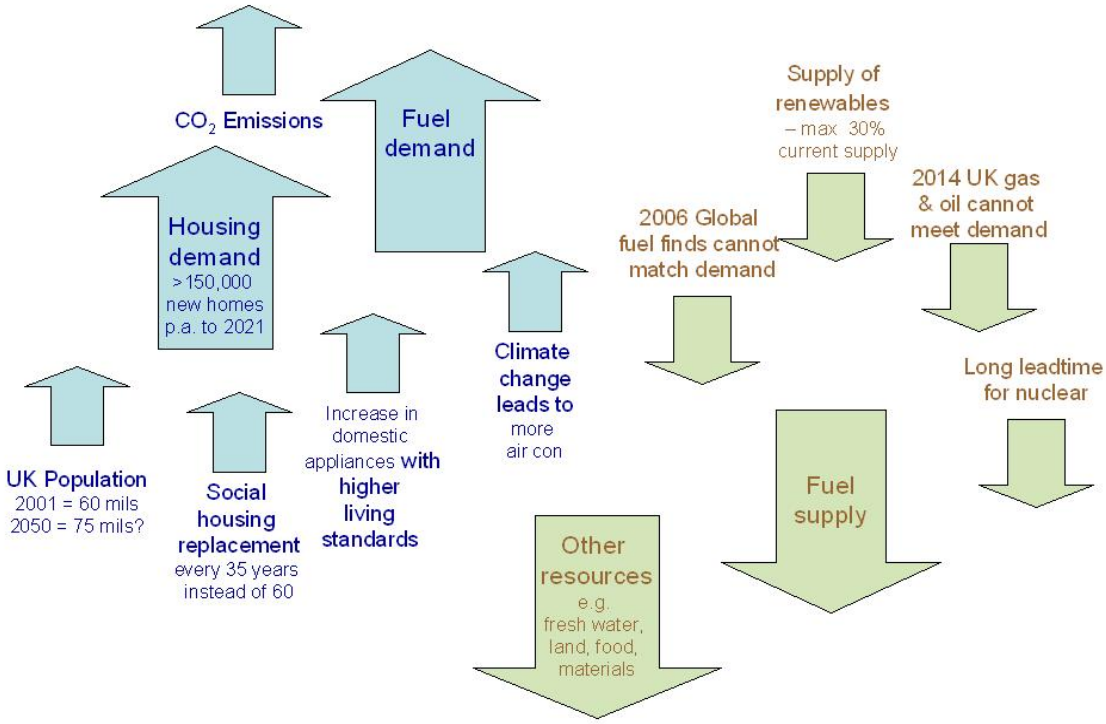

Figure 2 ***The ZED wheel*** *©Bda 2003*

Downward trend for fuel supply and other resources

A. The Royal Commission on Environmental Pollution[3] proposed a UK target of reducing carbon emissions by some 60% of current levels by 2050. This was confirmed and formalised in the Energy White Paper[4]. The UK also has a national target, which exceeds its Kyoto Protocol commitment, of 20% reduction in carbon dioxide emissions below 1990 levels by 2010.

B. Globally, peak oil production occurs in 2006 when, as India and China industrialise, new discoveries can no longer exceed demand. Recently, oil prices reached $55 a barrel, which is just an indication of more expensive oil to come. International competition for limited oil and gas supplies has historically generated huge competition and, frequently, conflict[5,6].

C. The latest Energy White Paper[7] admits the UK will now become a net importer of gas. Oil discoveries will no longer keep pace with demand within the next ten years. Gas companies have already indicated prices will rise above inflation in future years, and notified customers of increases in 2004 and 2005.

D. The UK is short of electricity-generating capacity now[8]. If demand continues to rise, the only way carbon targets can be met is to introduce more nuclear power generation, and/or expand the renewable energy generation programme. Expanding the provision of electricity through renewables means using both large-scale, green national grid, and at a local level, the use of micropower-embedded generation. The latter largely relies on building-integrated solar and wind technologies.

E. UK citizens' mistrust of nuclear power forces public debate and enquiries. This adds significantly to the lead-time for constructing new nuclear power stations. There is also relatively little Government funding and promotion of micropower-embedded generation.

F. Meanwhile, the time is rapidly approaching when the shortage of large-scale grid generating capacity could well result in powercuts, as is currently occurring in parts of the USA.

G. Professor Santamouris from University of Athens has recently published EU funded research showing that CO_2 emissions from Europe are rising steadily despite one of the most energy efficient global economies. This is mainly attributable to the urban heat island effect [temperatures in city centres are around 6 degrees hotter than surrounding countryside] as well as rising summer peak temperatures (due to climate change). As a result there is an increase in demand for carbon intensive grid electricity to run air conditioning systems. Air conditioning sales are rising steadily in South East England, and affordable cooling will become increasingly difficult as electricity costs rise.

H. With agriculture and local food production both highly dependant on fossil fuel and mains grid electricity, the industry will find it increasingly difficult to meet urban areas' demands for nutrition.

I. Herbert Girardet and SUSTAIN researchers have predicted that the UK will shortly import around 70% of its nutritional requirements. They also suggest that, should our national boundaries be sealed, as almost happened during the 'U boat blockade' in the 1940s, foodstocks and fossil fuel supplies for the urban population would only last around two to four weeks. Whilst this scenario is unlikely to be repeated, industrial, political or terrorist action could achieve a similar result. There are also ethical

reasons to reduce UK reliance on imported food if global social- and trade-justice between north and south is to be achieved. It will become crucial that the UK develops a local food production and distribution/supply framework that is capable of providing the population with its staple dietary requirements without relying on fossil fuel or nuclear energy.

J. CO_2 is currently traded at £6/tonne in the EU, and is predicted to rise by about £5/tonne each year for the next 50 years. By 2020 it is likely to be the equivalent of £105/tonne, and around £255 to £300/tonne by 2050[9]. This means we all have a 15-20 year window to invest in low carbon infrastructure before the embodied carbon of an update programme becomes unaffordable for many industries. This is likely to lead to extreme financial hardship in farming, and any other industries that are already struggling to invest in new technologies.

K. Even the most optimistic scenario suggests UK renewable resources can only produce around 30% of current energy demands. Most of this will be needed for homes, workspace, transport, IT, and industry. That leaves very little renewable energy to run farming.

So, how will the UK achieve its 60% carbon emissions reduction by 2050? Whilst useful in the short-term, industries and individuals buying green grid electricity simply sidestep the issue, as there will not be anywhere like enough generating capacity to meet demand. Much more radical solutions are additionally and urgently required.

L. The UN Millennium Ecosystem Assessment (MEA) outlines actions that businesses can take to improve their bottom line, reduce degradation of ecosystems, and benefit human well-being. These actions include: making business decisions that anticipate growing customer preferences for sustainably supplied services, new regulations, competitor strategies, investor demands for sustainable business models, and the establishment of market mechanisms[10].

For example:
- reduce carbon emissions,
- decrease nitrogen and phosphorus loading,
- increase efficiency of water and energy use,
- protect natural habitat and biodiversity,
- achieve the sustainable management of natural resources,
- make decisions informed by the full “life-cycle” costs of products.

M. A large part of the answer is to use a mixture of energy-saving building fabric, energy efficient master-planning, and building-integrated renewable energy alongside planning low environmental impact lifestyles and workstyles that reconnect the countryside with urban areas. Under this scenario, the national grid is likely to be refocused on embedded micro-generation rather than large scale centralised power stations. **It thus becomes very important that Commonwork considers itself as a net power generator**, meeting its own needs, and exporting to the grid when possible.

Upward trend in demand leading to pressures on the countryside

N. The UK population is increasing and modern lifestyles mean fewer people per home. The UK population census for 2001 recorded 58.8 millions people[11]. UN estimates for the UK in 2050 are 59.1 to 73.9 millions[12]. If the figure is 73.9 millions, it has serious implications for UK infrastructure, services and housing. Globally, in the same timeframe, the world's population is expected to increase by 50% from 6 to 9 billions[13].

O. Around 12% of the surface area of the UK is now covered by urban sprawl. The UK imports almost 70% of its food, and the average British meal travels over 2,000 miles from farm to dinner plate. In a low-carbon future without access to cheap fossil fuel, decisions taken today to build new housing on agricultural land could be bitterly regretted. However, that is exactly what is due to happen. The government's sustainable communities programme currently plans to build around 4 million new homes by 2050, approx. 50% of which are likely to be on agricultural land, mainly in the South East.

P. Around 5% of the UK working population is involved in agriculture today, compared with around 30% a century ago. The organic farming movement is likely to reduce its dependence on fossil fuel fertiliser and energy, as well as mechanisation. This could lead to an increase in the manpower/hectare ratio required to achieve similar levels of productivity. It is now virtually impossible to find affordable rural homes in many areas, as farmworkers' cottages reach premium sales prices as housing for retired people, long distance commuters, and often providing holiday homes. Repopulating the countryside with affordable rural homes on farms and within existing villages cannot be separated from the long-term objective of increasing organic farming. Commonwork could enter this debate by trialing some affordable rural homes.

Q. Climate change[14] is accelerating, leading to increasing summer temperatures and more flooding and storms. Some predictions indicate colder winter temperatures. We already need to design for Mediterranean summers in the South East of the UK, and wetter and windier conditions. Water storage in long, dry summers may become an issue, possibly making it important that longer-term rainwater storage for both animals and irrigation is required on the farm.

Figure 3 **The 21 Steps Chart 2004**

Steps	Description		Saving (hectares)	Total Eco Footprint (hectares)	Carbon Savings (tonnes/year)	Total Carbon Emissions (tonnes/year)
Start		Start with UK typical housing built to 2000 BRegs, built at average density. Average ecofootprint of residents is 5.45ha. (UK typical would be 5.62ha)		**5.45**		**11.9**
1	**Location**	If the site can be located within 10 minutes walk of good public transport links, this will allow savings from reduced car dependence	**0.05**	**5.4**	**0.1**	**11.8**
2	**Density**	Increase housing density by 30%, reduce road, paving and lawn areas from 80m2 to 15m2/person. Introduce sky gardens and sedum roofs to maintain amenity.	**0.09**	**5.31**	**0.1**	**11.7**
3	**Domestic Electrical**	Introduce electrical energy efficiency measures (A-rated white goods, low energy lighting) that reduce consumption to 3kWh/person/day.	**0.09**	**5.22**	**0.3**	**11.4**
4	**Building Fabric**	Introduce ZED specification building fabric that reduces space heating to 16.2kWh/m2/year (12% UK typical or 27% BRegs 2000) and hot water consumption to 6kWh/household/day (43% UK typical or 56% BRegs 2000).	**0.12**	**5.1**	**0.5**	**10.9**
5	**Provide workspace opportunities on-site**	Introduce offices, home working IT infrastructure and other non-residential uses. A proportion of residents will be able to work on site and avoid the need to commute. The larger the development, the more scope for people both living and working on site: **100 Homes (BedZED size), say 10% of workers - save 0.02ha;** **400 Homes (ZED quarter), say 25% of workers - 0.04ha**	**0.04**	**5.06**	**0.1**	**10.8**
6	**Energy efficient workspace**	Build workspace in the shade zone of the south facing homes, built to ZED specification. Energy use is 40% less than comparable conventional offices. Provide enough workspace for all the working population of the development. Even though many residents will work off site and other workers will commute in to their jobs, the energy efficiency savings in the buildings are the same per occupant.	**0.22**	**4.84**	**0.4**	**10.4**
7	**Primary school**	On 400 home developments upwards, include a primary school, built to ZED energy efficiency specification and allowing residents to avoid using the car for school run.	**0.04**	**4.8**	**0.15**	**10.25**
8	**Mixed use facilities**	A good mix of community, sports, childcare, retail and health facilities appropriate to the site will help to further reduce the residents' need to travel. Assume that an equivalent of 50% of services needed to support the population of the development are brought within the boundaries of the site and built to ZED specification.	**0.06**	**4.74**	**0.15**	**10.1**
9	**Car club**	Introduce car club service, allowing members to give up their private vehicles without sacrificing mobility. Assume 25% of car owners give up their car and so reduce their annual mileage to one fifth.	**0.1**	**4.64**	**0.2**	**9.9**
10	**Green travel plan**	In addition to mixed use facilities and a car club, introduce bicycle storage facilities and a programme of cycle promotion. Promote public transport and home delivery services.	**0.05**	**4.59**	**0.1**	**9.8**
11	**Alternative vehicles**	Introduce alternative fuel vehicles and ultra efficient vehicles for further reductions.	**0.08**	**4.51**	**0.2**	**9.6**
12	**Eco-travel agent**	Introduce green travel agent on site, promoting eco-tourism, with special deals for UK and European destinations, Eurostar deals, links with WWOOFers (willing workers on organic farms) and networks of European farm accommodation. Reduce average air miles from UK average of 14km/wk to 10km/wk.	**0.07**	**4.44**	**0.15**	**9.45**
	On overall transport impact, BedZED has achieved monitored savings of 0.38ha. A larger 400 home ZEDQuarter* development offers greater potential for a wide range of services and facilities and so greater potential for reducing the need to travel. Overall savings on transport could be 0.43ha (1.0 t CO2/year)					
13	**Renewable heat**	Generate all the domestic heat demands from renewable sources – either wood or solar thermal.	**0.09**	**4.35**	**0.3**	**9.15**
14	**Renewable electricity**	Generate all domestic electricity demands from renewables – mixture of wind and PV or from wood-fired CHP.	**0.12**	**4.23**	**0.5**	**8.65**
15	**Non-residential renewables**	Generate all energy for workspace and non-residential facilities from renewables.	**0.14**	**4.09**	**0.3**	**8.35**
16	**Construction materials**	Introduce a policy of low impact, local, low embodied energy construction materials (that perform to the ZED spec), sourced from reclaimed and recycled sources where possible.	**0.1**	**3.99**	**0.28**	**8.07**
17	**Low impact food programme**	Introduce farmers markets, space for growing food on site, links with local farms and local organic box schemes. Promote vegetarian and even vegan diets. **Eco-saint vegans who buy 70% fresh local produce and waste 40% less than average can save 1.25ha;** Moderate eco-samaritans who are vegetarian and get 50% of their food locally and fresh and waste 20% less than average can save 0.82ha; **Carnivorous eco-angels who eat a low meat diet, buy 70% fresh local produce and waste 40% less than average save 0.88ha;** Eco-part-timers who eat a low meat diet, take part in the weekly box scheme and reduce food waste by 20% can save 0.6ha.	**0.82**	**3.17**	**0.33**	**7.74**
18	**Bakery**	On site bakery where waste heat is tapped and used for heating.	**0.01**	**3.16**		**7.74**
19	**Waste reduction programme**	Campaign and advice on reducing the amount of packaging, introduction of community composting scheme with compost used on site for gardens and food growing displacing manufactured fertilizers.	**0.74**	**2.42**	**0.34**	**7.4**
20	**Recycling facilities**	Introduce easy, convenient recycling facilities and information on what to recycle where.	**0.51**	**1.91**	**0.45**	**6.95**
21	**Reduce impact of remaining goods and facilities**	Encourage residents to purchase fewer goods & services and/or to buy them from low impact sources. **10% reduction - 0.05 ha** (0.2t CO2 **reduction - 0.15ha** (0.4t CO2) **0.24ha** (0.7t CO2) **30% 50% reduction -**	**0.15**	**1.76**	**0.45**	**6.5**
	Total Savings		**3.69**		**5.4**	

*The term ZEDquarter refers to a community of around 400 homes that could be a mixed use regeneration of an existing urban quarter, a new build development or both

Data provided by Best Foot Forward

21 Steps approach to reducing energy consumption

R. The 21 Steps approach (see figure 3) shows the contribution made to reducing fossil energy consumption by each of a series of 21 steps. The steps themselves are a mixture of construction choices, such as building fabric with high thermal mass that stores and reuses energy, and community services, such as a green transport plan or car club. Each step is independent of the rest, and so the savings can be worked out depending on which elements are designed into the scheme. Together, the 21 steps reduce energy consumption and therefore, CO_2 emissions to 2050 levels.

S. Steps 17, 18, 19 and 20 all relate to food production, processing and distribution, and show how the zero fossil energy farm can contribute to greatly reduced carbon footprints on a wider scale by examining how its produce reaches the urban consumer. These steps suggest new roles for farming by adding value and reducing processing, packaging and the environmental impacts of transport.

T. A preliminary analysis by carbon footprinter Best Foot Forward and Dr Colin Tingle suggests that Commonwork has already achieved a carbon- and resource-efficient organic farm with a far lower ratio of fossil fuel to productive output than the UK industry standard. This achievement deserves recognition and celebration. However the farm does not exist in isolation, and can potentially go further to demonstrate the next development in organic farming. We suggest this objective is to show how the Commonwork farm can both deliver the 60% overall carbon reduction target from field to dinner plate, and show how an organic farm can both produce and distribute its products without relying on fossil fuel. This creates the ZEF, the Zero fossil Energy Farm.

The following ideas could transform the excellent organic farm into the ZEF of 2050. This step-change process could be summarised as '2050 today'.

- The **ZEF** concept could provide Commonwork with a clear mission for the next ten years that fits into national long-term carbon reduction strategies (and coincides with the UN decade of sustainable development 2005-2015).

- The **ZEF** research document would be disseminated widely and the process shared in local and national farming, environmental and educational networks.

- The Commonwork farm and study centre could offer training courses on **ZEF** conversions for existing farms and visitors of all ages.

- The **ZEF** would clearly integrate countryside production with urban consumers, exploring community supported agriculture through a contract to directly supply urban **ZED**s (Zero fossil Energy Developments)

- The **ZEF** would add value by minimising the need to process food by other remote parties, and avoid packaging, which requires a high consumption of fossil fuel and resources.

- The **ZEF** could coordinate the produce from a variety of local organic farms to provide a coordinated service to urban communities. By minimising the environmental footprint of food distribution, it should be possible to help urban communities move towards living within their earthshare.

The changes we can make

The following practical steps could achieve a Commonwork ZEF within ten years

1 Undertake a detailed energy audit of the farm systems
(approx budget £20,000, tbc)

This would involve:

- **A** A detailed investigation into each aspect of the Commonwork farm system, and the food supply chain of which it is a part; identifying major areas of energy use and the ways to reduce these.
- **B** Implementing reductions (costs and income benefits as yet unknown).
- **C** Investigating the impact on farming systems and practices of the reductions as they are researched and implemented.
- **D** Sharing this information in the farming industry, with education and environment sectors and, as appropriate, with the public.

2 Run farm machinery on carbon neutral biodiesel
(approximate budget £25,000, tbc)

Underpinning this work is the need to give food production priority on agricultural land.

- **A** Investigate existing and current work in the production of biofuels and recycling of vegetable oil for biodiesel
- **B** Investigate importing vegetable oil/biodiesel from surrounding local farms and suppliers, especially used cooking oil (eg chip fat) from nearby urban areas
- **C** Assess the usefulness of growing a small area of biodiesel crop on Commonwork land as a demonstration exercise. But hold in mind food production as a priority.
- **D** If appropriate, set up small-scale oil press at Commonwork
- **E** If appropriate, set up a biodiesel production plant on site, which allows unmodified engines to be used. This would be a useful demonstration device for visitors to show vegetable oil being converted to transport grade fuel (cost £5,000)
- **F** Ideally modify farm diesel engines to run on recycled vegetable oil.

3 Reduce greenhouse gases from methane derived from animal waste
(approximate budget £150,000 tbc)

The two options are:

- **A** Research a new-generation methane digestion, restore the biodigester, and burn methane in a gas powered CHP engine. This is conventional technology, and should be economically viable to install, but requires careful consideration of practicalities and costs of running. (A herd of 300-360 cows should produce around 10 tonnes slurry/day, producing 155,125 kwh electricity/year and 228,125 kwh of heat/year)
- **B** Restore the biodigester tank and chemically convert methane in a hydrogen fuel cell, producing green electricity and water. This is the preferred option though pricing is too difficult at this stage and a university would have to be involved, with major research project backing. Likely cost around £150,000, which is expensive. The advantage is potentially low maintenance, no moving parts in the CHP unit, and highly innovative so likely to attract research funding.

4 Generate remaining on site electrical demands from renewable energy sources
(approximate budget £100,000 tbc)

A Install two Proven 15 kw wind turbine producing around 30,000 kwh/annum each on Bank Field @ £25,000 each. The 9m diameter dark grey blades are more likely to pass planning restrictions and are probably almost invisible from the nearest house.

B Install one no 225 kw second hand Spanish Vestas turbine 30m diameter blades producing around 3,000 kwh/annum costing around £ 50,000 each installed, depending on negotiation and availability. The large tower and blades are likely to be controversial in planning and it is hard to see how this would succeed without remarkable support from neighbours. Easily the most cost effective and iconic solution. No loss of grazing land.

C Install solar electric panels on roofs (allow £3,000/kW peak of installed generating capacity producing around 1,000 kwh/annum). This technology is important as an educational and demonstration tool, so fit on the new visitor centre and the new rural ZED homes (allow £12,000 for 4kwpeak installed as solar shading on the glazed visitor centre roof).

5 Generate all heat requirements from renewable energy sources and increase energy and water efficiency throughout building fabric
(approximate budget £25,000/building chosen; allow £150,000 for majority of buildings in Commonwork hamlet)

A Heat visitor centre with ceramic kacheloven, a super efficient woodburning stove with back boiler and integrated hot plate for samovar/kettle. Warm seating designed into stove, designed to maximise the use of the on site brickworks.

B Install district heating main providing back up heating to all buildings and distributing heat from the methane CHP plant. The cost of insulated pipework, pumps and re plumbing existing buildings likely to be around £100,000, so investment at this stage questionable, however it is a super-efficient concept. Possible with grant funding.

C All fuel oil and LPG gas powered appliances replaced with individual programmable self-igniting wood pellet boilers, one for each building. Allow 3 no installations @ £12,500 each. It may be worth installing pellet-making plant on the farm, although this technology is being developed elsewhere in Kent. Possible cost around £25,000, but this would be a useful future income generator for export to urban areas.

D Install solar thermal evacuated tubes on all existing buildings, approx one set/hot water cylinder. This reduces the run time of the pellet boilers in summer. (approx cost/building around £5,000 including existing tank replacement with new super-insulated system

E Maximise energy and water efficiency of existing buildings
Complete installation of energy efficient lighting
Install Class A electrical appliances in all buildings
Improve draught proofing
Install double glazing with low E where appropriate [few locations without spoiling architectural character]
Install spray taps and showers
Install external insulation systems where appropriate [not priced]

6 Research and set up ZEF-ZED food provision link, with web-based ordering schedules and contracts with urban communities, enabling a regular income, and reducing food miles.
(approximate budget £25,000 tbc, plus cost to set up IT based ordering system. Would require full time administrator eventually.)

This would require the following stages to set up the scheme:

A Carry out a provisional survey of BedZed inhabitants to assess the numbers of potential customers for the ZEF-ZED food-link option and their requirements/demands, flexibility acceptable, budgets available for food, and include any ideas/suggestions from inhabitants

B Carry out a survey of farms local to Commonwork and between Commonwork and BedZed to assess produce available, which meets needs identified from BedZed survey and costs thereof. Research shortfalls and potential producers/suppliers. Assess costs of ZEF-ZED link scheme.

C Carry out carbon analysis and ecofootprint analysis of food production/provision for various scenarios: BedZED business as usual; BedZED current Eco-angel business as usual; ZEF-ZED food link options.

D Install a communal deep freeze and secure larder, allowing deliveries to urban communities without having to co-ordinate drop offs with individual households.

E Develop unique Commonwork recyclable woven delivery baskets that enhance an urban interior, rather than brutal coloured plastic crates or cardboard boxes usually encountered with foodbox schemes. This would contribute to zero packaging concept

F Research options for ZEF-ZED food transport link (including ecofootprint analysis) and put preferred option into practice, e.g. biodiesel vs electric options for and purchase (if appropriate) of a small zero emissions delivery van with on board refrigeration.

G Assess appropriate action to coordinate the supply of vegetables, cheese and meat to urban communities as an alternative to supermarket shopping.

7 Set up a visitor/education centre in Middle Yard
(approximate budget £175,000 tbc, plus Commonwork-ZEF exhibition.)

The centre would greatly improve opportunities for learning about food, farming, and the environment, all within the ZEF context of the ZEF, for Commonwork's 8,000+ visitors per year, schoolchildren and adults. This is important so that the public can visit the source of their daily food, allowing Commonwork to explain the differences between organic, ZEF and industry-standard farms. It would also provide opportunities to engage with the local community, thus helping to foster mutual respect.

As many of the technologies mentioned in the previous points would be included within the exhibition/visitor centre, a clear circulation system is required, allowing visitors to watch activities safely.

8 Extend centre kitchen
(approximate budget £120,000 tbc)

- **A** Enlarge the working kitchen to run training programmes for school students and adults
- **B** Introduce a café concept, which would only be staffed when groups arrive.
- **C** Expand the permaculture garden to a fully fledged kitchen garden, capable of maximising the output fresh vegetables and herbs for the kitchen (already underway in the organic vegetable garden linked to the permaculture garden by a footbridge; plus wood-fuelled bread and pizza oven installed in garden in 2005. Small-scale organic, free-range egg production scheduled for 2006).
- **D** Add horticultural glasshouses to the kitchen to provide a mid-season, semi-outdoor dining space, and grow more Mediterranean produce [citrus, peppers etc]

9 Add two Rural ZED three bedroom homes for visitors
(approximate budget £185,000 tbc)

- **A** Install demonstration of affordable eco-homes specifically designed for a rural context. This will be crucial for visitors of all ages to find out by experience that high quality accommodation and a zero fossil fuel home can be one and the same thing.
- **B** Offer green tourism holidays on the farm for people wishing to engage with Commonwork as volunteers or students; and for those who just want a holiday and would not otherwise come into contact with the Commonwork and ZEF ethos.
- **C** Homes would be fully carbon neutral with solar thermal, building integrated wind, photovoltaic panels and wood-burning stoves with back boilers. One home would have wheelchair access.
- **D** Run the construction of the rural ZEDs as a six-week training course for interested builders and members of the public.

Conclusions

The Urban ZED process pioneered a step change reduction in resource consumption at the same time as offering a higher quality of life for residents. This proposal offers a similar potential for rural agricultural contexts, with Commonwork showing how farming can deliver a high quality product that outperforms conventional fossil fuel approaches and simultaneously stimulates rural regeneration.

By taking organic farming principles further, Commonwork can re-think UK agriculture using ZEF methods to create viable, practical solutions. The results will increase the quality of life for ordinary people, reduce dependency on fossil fuels and contribute to a more stable, democratic, and peaceful society.

This roadmap builds on the excellent work already achieved at Commonwork to date, and will mean that Commonwork is able to meet most of the UN suggestions for business and industry, whilst simultaneously providing a mechanism to help the UK government meet its carbon reduction targets for 2050 by 2015.

The total cost of the ZEF project is likely to be around £950,000, excluding Commonwork staff time. The costs could be spread over an eight to ten year period, with an average annual spend of around £100,000-00/annum. There may be items in the outlined proposal that can be rationalised or simplified, for example, if the biodigester CHP is installed, there may be enough waste heat produced to preclude the need for investment in building fabric upgrades or wood boilers. Further savings can be made by employing on-site labour from existing staff and contractors where possible. Considerable detail is required to produce a sensible implementation plan, however experience from other complex renovation projects indicate these approximate costs to be reasonable value.

There is no attempt to justify these costs commercially, as this is a pilot project and would bear research and pioneering costs. However it would aim to deliver a working model, which would operate with a sustainable triple bottom line (social, environmental and financial), and would share the learning and demonstrate farming systems and practices for replication through the industry.

ZEDfactory, Best Foot Forward, Commonwork and their partners are working together in partnership with enthusiasm, expertise and appropriate experience to see this proposal become a working reality.

The first step…

The first step towards achieving the ZEF vision includes:

- circulating this working document to friends and colleagues in farming, education and sustainable development networks;
- consulting with neighbours and local authorities;
- submitting plans to the local council.

If you can help in any way or would like to stay in touch with our progress, please contact Jacqueline Leach, Commonwork director, jacquelinel@commonwork.org

References

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