

Mt Alexander Fruit Gardens Sustainability Plan

Hugh & Katie Finlay

2011



In this plan we have described the lifestyle we enjoy and the type of business we want.

We have calculated our carbon footprint and committed to becoming carbon-neutral by capturing as much carbon from the air each year as we release into the atmosphere as carbon dioxide.

We aim to run a self-sufficient business, with all inputs being produced on the farm, as far as is practical.

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1. BUSINESS AND LIFESTYLE DESCRIPTION

1.1. OUR PRINCIPLES

PRINCIPLE	HOW WE ACHIEVE IT
We are happy, healthy, and satisfied	Eat well, get enough sleep, exercise regularly, commit time to relationships and family, work together, separate areas of interest, look after our farm and home, undertake regular training in areas of interest
We value our time	Self-employed, flexibility in working hours, efficiency (maximum \$ return on hrs), minimise weekend work, make spending time together and with the kids a priority
We value diversity	Off-farm income, diverse crops, multiple sources of energy, water, food, labour, and markets
We are profitable and financially secure	Off-farm income, maximise farm income and efficiency of hours worked, good financial planning, being open to new career and business opportunities, earn a minimum combined of \$100,000 pa, grow high yields of quality fruit
We minimise our carbon footprint and run a carbon-neutral business	Reduce emissions (sustainable packaging and transport, reduce water, electricity, and fuel use)
	Increase energy production (solar, wind)
	Increase carbon sequestered (orchard, soil, pasture, reveg)
	Sell fruit locally, i.e., in water catchment where fruit is grown
	Buy carbon offsets
We promote organic and biological farming	Share information, welcome people onto our farm including wwoofers, enable access to the business for our kids, participate in local sustainability and food relocalisation projects
Our lives are uncomplicated	Leave the farm regularly for holidays and to contribute our skills in other communities

1.2. WHAT IS MOST SUSTAINABLE ABOUT OUR BUSINESS AND LIFESTYLE?

- We have clear goals to guide our decisions.
- We have achieved full organic certification with the National Association of Sustainable Agriculture Australia (NASAA).
- Our fundamental farming practice is to improve our soil by increasing beneficial microbiological activity and organic matter through the use of practices including compost and compost tea, with the aim of producing
 - increased soil carbon levels;
 - increased water-holding capacity of soil;
 - increased resilience to drought, frost, and harsh conditions;
 - improved soil structure;

- better (and free) nutrition for orchard trees and grasslands;
- healthier plants;
- increased resistance to pests and diseases; and
- more nutritious fruit.
- We have a substantial customer base, and a diverse range of markets.
- We have a risk management strategy including a diverse range of products.
- Our sustainability plan is based on the *triple bottom line* model, where **personal sustainability** (what we need to feel happy and satisfied), **social sustainability** (how our business fits into the wider economy, what our customers want, how we interact with peers, etc.), and **ecological sustainability** (the environment, global issues, etc.) have all been considered..

1.3. WHAT OBSTACLES TO SUSTAINABILITY DO WE NEED TO OVERCOME?

1.3.1. Climate change

One major challenge is climate change. According to the Australian Government, "warming of the climate system is unequivocal" and "humans are very likely to be causing most of the warming that has been experienced since 1950. Since 1950, most of eastern Australia has experienced substantial rainfall declines. It is very likely that changes in the global system will continue well into the future, and that they will be larger than those seen in the recent past."¹

seasonal and annual average temperatures and rainfall in the North Central region for 1961–1990 are in the following table.²This data has been collated by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Australian Bureau of Meteorology(ABOM) from the results of 23 global climate models. The average annual rainfall total is from the ABOM data for Harcourt.

	Annual	Summer	Autumn	Winter	Spring
Average daily temp.(°C)	14.8	21.0	15.3	8.7	14.2
Minimum temp.(°C)	8.5	13.1	9.1	3.8	7.7
Maximum temp.(°C)	21.2	28.9	21.5	13.6	20.7
Rainfall (mm)	636	90	122	150	130

However, since 1960 the following climate trends have been recorded:³

	Annual	Summer	Autumn	Winter	Spring
Mean temp.(°C/10years)	+0.15	+0.15	+0.10	+0.20	+0.30
Minimum Temp (°C/10years)	+0.05	+0.15	-0.50	+0.15	+0.10
Maximum Temp (°C/10years)	+0.30	+0.15	+0.20	+0.30	+0.40
Rainfall(mm/10 years)	-30	-5	-10	-5	-10

If these trends continue (and that is a conservative outlook—it is very likely changes will be more dramatic in future years), this means actual temperatures and rainfall may be as follows:

¹<http://www.climatechangeinaustralia.gov.au/>

²*Climate change in the North Central region*, Victorian Department of Sustainability and Environment, June 2008.

³[http://www.bom.gov.au/cgi-](http://www.bom.gov.au/cgi-bin/climate/change/trendmaps.cgi?map=tmean&area=vic&season=0112&period=1960)

[bin/climate/change/trendmaps.cgi?map=tmean&area=vic&season=0112&period=1960](http://www.bom.gov.au/cgi-bin/climate/change/trendmaps.cgi?map=tmean&area=vic&season=0112&period=1960)

	2020	2030	2040	2050	2060	2070
Average daily temperature (°C)	14.95	15.10	15.25	15.40	15.55	15.70
Rainfall(mm)	576	546	516	486	456	426

Other trends that have been observed (and are projected to continue) in the North Central region since 1998 include:

- an increase in the average annual number of days over 30°C (projected to increase by up to 75 extra days by 2030);
- a decrease in the number of nights lower than 5°C (projected to decline from 35 to 22 nights by 2030);
- an increase in the number of extreme fire danger days leading to increased risk of bushfires; and
- a steady increase in evaporation rates.

Though rainfall is expected to decline, the intensity of heavy rainfall is likely to rise in more seasons, i.e., the rain will fall on less days but be heavier, with more droughts anticipated.

Positive impacts of climate change

- higher carbon dioxide (CO₂) levels enhance plant growth and water-use efficiency,
- fewer frosts means less potential damage to blossom and fruit, and
- lower rainfall means less potential fungal disease issues in fruit.

Direct negative impacts of climate change

- lower rainfall means less soil moisture on the farm;
- lower rainfall in the catchment means reduced availability and reliability of irrigation water;
- fewer cold nights means lower chill factor, which is essential for fruit set;
- greater risk of bushfires;
- more hot days and higher solar radiation which can damage fruit and cause health issues for workers;
- more extreme weather conditions and events means higher risk of damage to crops through excessive rain, hail, wind, and storms;
- price of irrigation water and water infrastructure costs are likely to increase dramatically; and
- bird damage of fruit may increase as their regular food supplies are affected by drought or extreme weather events.

Indirect negative impacts

- biodiversity may be reduced as species alter distribution, abundance, behaviour, and timing of events such as migration and breeding;
- existing threats such as habitat loss and invasive species may be amplified by climate change;
- communities will be affected by rising costs, changing living conditions, and increased weather events and threats; and
- New pests and diseases may affect our crops as conditions change (e.g., fruit fly).

1.3.2. Peak oil

Peak oil describes the point in time when the maximum rate of global petroleum extraction will be reached, after which the rate of production enters terminal decline. Many people are saying we are on the cusp of the peak now.

It is impossible to accurately predict the effects of the decline of oil production, but possible severe increases in the oil are a likely outcome, with dramatic implications for the structure of our society, which at the moment is heavily reliant on a cheap-oil economy. We foresee potential impacts on the global economy, transport, agriculture, energy, manufacturing, and processing industries.

Our risk strategy is to prepare for a future in which oil becomes dramatically more expensive. For us this means localisation of our markets, reducing reliance on the use of oil within our business, increasing our self-reliance for energy needs, increasing self-sufficiency for farm inputs, and strengthening our local economy and food production systems.

By doing so we are also contributing to a low-carbon future and adding to the resilience of our business, family, community, and planet.

1.3.3. Other challenges

- Household energy use remains high.
- Car and air transport remain major greenhouse gas contributors.
- Activities that use a lot of energy such as fruit refrigeration and pumping water are still big contributors to our greenhouse gas production.
- Packaging fruit for the wholesale market into new cardboard boxes (even though the boxes are made of recycled material) creates a lot of waste for the retailer.
- We waste a lot of personal energy by double- or triple-handling fruit due to old or inadequate equipment and infrastructure; all fruit is loaded by hand into the chiller and then transferred by hand into the packing shed, often more than once.
- While the business is profitable, in both the 2009/10 and 2010/11 seasons it returned only a low wage to Katie for the amount of hours worked, and no income to Hugh. In the last 3 years Hugh's off-farm work (contract editing from home) has been the main income supporting the family. He enjoys this work and his farm work commitment has been reduced to allow him to spend much of his time in the office; however, fitting his farm work around it does at times put him under pressure.
- Winter pruning is becoming too large a job for Katie to do alone, and takes too high a physical toll on her body.

1.4. FUTURE DIRECTIONS: HOW WILL OUR BUSINESS AND LIVES LOOK WHEN WE ARE MORE SUSTAINABLE?

1.4.1. Whole farm plan

We are developing our farm according to the permaculture principles of providing as many needs as possible from our own land, using the least land possible to do so, and getting multiple uses from all elements that make up the farm and business. We value diversity in income production (including off-farm income) and crops, as insurance against disasters. We continue to build other farm resources to provide multiple sources of energy, water, food, and income.

Thus, we aim to

- produce as much of the food we consume from our own land as is practically possible;
- continue our native revegetation and weed control program on any land not needed to produce our food or income;
- produce our own farming inputs such as compost and any natural insecticides we use;

- deal with pest and disease problems (and not all pests and diseases constitute problems that require action) as naturally as possible, through the promotion of soil and plant health, animal predation, and natural home-grown (or wild harvested) and home-made insecticides; and
- re-use or recycle most of our waste products (orchard, animal, human, and domestic) in a productive way, particularly ensuring all nutrients are returned to the soil.

Our plan for the farm continues to evolve within the parameters set by our principles (see p.2)

- We have a plan for the orchards which has been steadily implemented over the last 5 years. This involves continuous soil improvement, replanting appropriate varieties to maximise economic return, and introducing new training systems to reduce labour costs and increase productivity.
- A 4.2 ha revegetation zone has been set aside, fenced, and seeded.
- Katie has completed a Permaculture Design Course incorporating a design for zone 0 (the house) and zones 1 and 2, which are the areas directly around the house. This includes extensive vegetable gardens; expansion of the home orchard; a house paddock for a milking cow and other livestock; more chickens; a greenhouse; modifications to the house to improve energy efficiency and comfort; a system to collect, store, and distribute water to the garden; and an outdoor recreation/cooking/eating area. This plan has been partially implemented.
- Since selling the cows several years ago in response to low rainfall, the remaining areas of the farm, which consists of paddocks with remnant vegetation, has been left vacant and allowed to regenerate. We continue to consider options for using this part of the farm that meet all our goals. To this end, Katie is studying Certificate III in Permaculture. In 2010 we bought a 7 ha block of land adjacent to the farm which has been used for granite quarrying in the past. The block is very weedy, with a leaky dam. We bought it to prevent it being inappropriately used (e.g., as a motorbike track), and because we love the views, the trees, and the rocks on the block. At this stage we have no firm plans for use of the block apart from vague plans to build a retirement home there.

1.4.2. Climate change adaptation strategies

Effect of Climate Change	Strategy
Decreased frost frequency and decrease in cold nights	Review variety selection to favour low-chill varieties.
Increased frequency of extreme weather events	Review variety selection to favour tougher varieties that can withstand floods and drought, e.g., plums are more durable than cherries.
Decreased rainfall, lower availability and security of irrigation water	Increase on-farm water harvest and storage through keyline strategies. Continue soil improvement strategies to increase carbon content of soil to maximise water-holding capacity.
Increased daily temperatures during harvest season	Adjust work practices to maximise cool hours for picking and packing fruit. Ensure fruit is chilled as quickly as possible after picking to maintain quality.
Altered range and incidence of pest and disease	Maintain monitoring and response to changing conditions. Continue soil improvement strategies to ensure maximum tree health and resistance to pests and diseases.

1.4.3. Local land care: connecting country

As part of an initiative between the Harcourt & District Fruit Growers Association (HDFGA) and Connecting Country, we are taking part in a habitat monitoring project. We are one of three local

orchard properties providing sites for nesting boxes in remnant trees close to orchard. The HDFGA is also taking part in another project to restore the local landscape by controlling weeds.

1.4.4. Planning for a low-oil future: our commitment to a carbon-positive future

We are planning for resilience in a future that will be characterised by climate change and the myriad impacts of high oil prices. To remain productive, protect our farming income, and be part of the climate change solution, we are committed to being a carbon-neutral business, and contributing to the long-term security of our community by advocating for sustainable and regenerative farming practices, and by being involved in local sustainability projects.

As noted in our goals, we aim to have at least a neutral effect on the carbon cycle – i.e., we want to sequester as much carbon through our farming activities (trees, crops, grasslands, and soil improvement) as we generate through our business and lifestyle. We want to generate at least as much electricity (through wind and solar) as we use. The purpose of this plan is to map this journey.

1.4.5. Lifestyle aims, prosperity planning, and financial security

To support our principles (p. 2) we are

- becoming educated about investment and developing a financial plan incorporating an ethical investment plan;
- exercising regularly, eating well, and having regular preventive health treatments to look after our bodies;
- undertaking retraining to provide more options for earning an income (Katie is studying for a Certificate III in Permaculture, carbon farming);
- regularly spending time on our relationship, including at least one specific relationship-building exercise each year;
- taking responsibility for our personal growth and managing our emotions in a way that is supportive to ourselves, each other, and the rest of the family; and
- planning farm management in the future to allow our absence from the farm for periods of up to 2 months each year, including
 - employing workers for pruning and other jobs as necessary, and
 - streamlining and documenting farm management to work towards creating a management role for someone other than Hugh and/or Katie in the future.

We live in a beautiful and healthy environment and are keen to share it with family, friends, and others who appreciate and would like to learn about our environment and lifestyle. We will

- minimize weekend work to enable us to spend time with our children, family, and friends, socializing and relaxing;
- develop the business in such a way as to allow our children and their families to be involved in the business now and in the future if they want to;
- develop (with our kids) a transparent and frequently revisited succession plan for the farm;
- welcome WWOOFers, agricultural trainees, and other similar visitors to the farm to be involved with our farming life in a spirit of cooperation and exchange;
- develop a range of on-farm accommodation options so family and visiting workers can stay in comfort and beauty;
- have enough regular help on the farm that Hugh has flexibility to retain his off-farm job without having to work at night;

- work towards relieving Katie of the heavier tasks of pruning and double-handling fruit;
- work towards being able to leave the farm for 2 months each July–August;
- willingly and openly share information about our farming practices;
- remain committed to ongoing professional development in our individual interest areas, undertaking study and attending training courses, seminars, workshops, and field days; and
- build a comfortable and efficient packing shed incorporating an energy-efficient coolstore.

1.4.6. Long term and succession planning

We have bought the farm from Katie's dad, and are paying an interest-only vendor's mortgage, which is a very manageable debt for us.

We are looking to the future when we will gradually retire from active farm work, and plan to travel.

While maintaining our carbon neutral lifestyle we will

- continue to develop our skills and experience to the point where we can meaningfully and profitably share them with others;
- leave the farm for warmer climes each winter, possibly combining travel with off-farm work, leaving the farm in capable and experienced hands; and
- spend time with the family and be involved with our community.

The climate change scenarios currently available seem to indicate that while the farm will probably still be viable in 2030 (in 20 years), it may not be in 2070 (60 years). This affects our succession planning, as we wish to provide our children with the most appropriate assets to give them and their families a degree of security into the future. This farm probably will not provide that security.

2. BENCHMARKING ENERGY USE AND ACHIEVING CARBON-NEUTRAL STATUS

2.1. SUMMARY OF EMISSIONS

Source of emissions	2007/08	2008/09	2009/10	2010/11
Farm	11.32	11.51	9.23	5.00
Domestic	31.85	24.02	14.90	8.50
Flights – domestic	0.00	0.00	7.28	9.76
Gas – domestic LPG	0.26	0.26	.26	.26
TOTAL	43.43	35.79	31.67	23.52
Sources of sequestering				
Orchard trees	20.20	20.20	20.20	24.28
NET TOTAL EMISSIONS (tons CO₂-e)	23.23	15.59	11.47	-0.76

tons CO₂-e = tons of CO₂ equivalent

2.2. WHAT HAS BEEN INCLUDED IN CALCULATION OF OUR EMISSIONS & WHY?

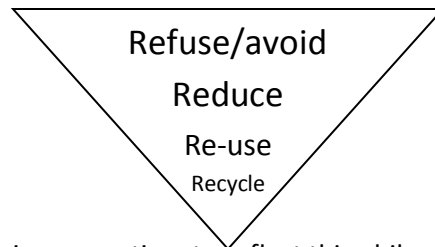
Since first writing this plan in 2008 when we calculated our own carbon footprint, there are now carbon calculators available that are more appropriate to our situation, and we have used the HortCarbon calculator from the Horticulture Australia website.⁴ The data used to calculate our carbon footprint has been collated in Excel documents⁵ and is summarized in the following table.

Data	2008/09	2009/10	2010/11
Electricity – farm (kWh)	7,470	4,622	1102
Electricity – domestic (kWh actual amount used)	14,430	12,690	12,032
Electricity – domestic (kWh, amount included after offset)	14,430	6,600	0
Petrol – farm (L)	766	639	501
Petrol–farm, driving to markets (L)	199	106	200
Diesel – farm (L)	0	630	691
Diesel – share of neighbour’s truck (taking our fruit to market) (kg CO ₂ -e)	65	65	65
Petrol –domestic, car (L)	764	870	946
LPG-domestic, car (L)	3,105	3,234	4,214
Flights – domestic (kg CO ₂ -e)		7,280	9,760
Waste – farm, green, disposal of prunings (ton)	2.00	2.00	2.00
Waste – domestic, plastic, glass, metal (ton)	1.25	1.25	1.25
Gas – domestic LPG, cooking (kg CO ₂ -e)	260	260	260

In line with most agricultural calculators, the HortCarbon calculator is designed to calculate emissions from farm operations only (not from domestic activity). However, in light of our commitment to a carbon-neutral lifestyle, we believe it is more ethical to also include the greenhouse gases generated by our domestic activities. Some of these (e.g., flights) were calculated in other emissions calculators and added as a kilograms of CO₂ equivalent (kg CO₂-e) figure.

We have made our calculation based on our use of resources that give us operational energy. We have not included embodied energy in consumables used in our family life or business as the information is very difficult to obtain or calculate.

We have, however, made a commitment to use as little energy from nonrenewable sources—such as fossil fuels—in our business as possible. We have adopted the philosophy of



We will continue to adapt our business practices to reflect this philosophy wherever possible and practical. Specific measures are included in our 5-year sustainability plan.

⁴http://www.horticulture.com.au/areas_of_Investment/Environment/Climate/climate_tools.asp

⁵“Electricity usage to go with SP.xlsx” and “Fuel usage to go with SP.xlsx”

2.3. CARBON SEQUESTRATION THROUGH OUR FARMING ACTIVITIES

Growing orchard trees, encouraging perennial ground cover in the orchards, revegetating areas of our farm, cropping the non-orchard areas, and, particularly, increasing the microbiological activity and organic matter in our soil are all likely to be sequestering carbon. However, accounting for this carbon in a verifiable fashion is difficult.

The Carbon Farming Initiative was passed as legislation in August 2011, and in due course this will provide accredited methodologies for accounting for carbon sequestration through farming activities. Until then we continue to rely on the information we used in our original sustainability plan and have only included a calculation for the carbon sequestered into the biomass of our orchard over the lifetime of our trees (see 2.3.1).

2.3.1. Orchard trees

According to a New Zealand review of published literature for measurements or reliable estimates of the standing biomass of orchard crops,⁶ apples and pears sequester 66 tons of CO₂ per hectare (ha), peaches and nectarines 73 tons/ha, and plums 114 tons/ha. No figures were available for cherries or apricots, so we have used the lowest figure (66 tons/ha) for our calculation of the amount of CO₂ sequestered by the orchard trees at Mt Alexander Fruit Gardens (assuming that Australian conditions are similar to New Zealand conditions).

Crop	Hectares	Tons CO ₂ /ha	Tons CO ₂ -e sequestered over the lifetime of the tree
Apples	0.54	66	35.64
Pears	0.18	66	11.88
Peaches	0.71	73	51.83
Nectarines	0.36	73	26.28
Plums	1.16	114	132.24
Cherries	1.00	66	66.00
Apricots	0.61	66	40.26
TOTAL	4.96		364.13

- The average lifespan of a commercial orchard is 15 years, so we can divide 364.13 by 15 to estimate that **24.28 tons of CO₂** are sequestered by our orchard trees every year.
- Some of the CO₂ is released back into the atmosphere each year via prunings being burnt, and this has been calculated as 2 tons of green waste per year in the HortCarbon calculator.

2.3.2. Soil carbon

According to Dr Christine Jones, principal of Amazing Carbon,⁷ whose work is referenced in the Garnaut Report,⁸ the world's soils hold three times as much carbon as the atmosphere and over four times as

⁶Kerckhoffs L.H.J and J.B. Reid. 2007. Carbon sequestration in the standing biomass of orchard crops in New Zealand. Report prepared for Horticulture New Zealand by New Zealand Institute for Crop and Food Research. Hastings, New Zealand:26 March.

⁷ www.amazingcarbon.com

⁸Garnaut, R. 2008. "Soil Management," chap. 22, sect. 22.3.2 in *The Garnaut Climate Change Review: Final Report*. Cambridge University Press.

much carbon as the vegetation. Soil therefore represents the largest carbon sink over which we have control.

Dr Jones has proposed the Australian Soil Carbon Accreditation Scheme (ASCAS) that would pay farmers for the carbon stored in their soil, plus the increase in the amount of carbon in the soil each year, as explained at the 'Managing the Carbon Cycle' workshop at Katanning in 2007.⁹ Her methodology for calculating soil carbon stocks is outlined in our first sustainability plan (2008). We have not repeated it here because until such time as a reliable methodology has been included in the Carbon Farming Initiative, we will not include sequestered soil carbon in our carbon equation.

2.4. EVALUATING OUR PROGRESS: HOW AND WHY HAVE OUR EMISSIONS CHANGED?

Our net total emissions have steadily declined since we began implementing our sustainability plan in 2009. This is attributable to a number of factors:

- Farm emissions have declined mainly as a result of installation of a 1kW solar system on the farm electrical circuit.
- Ceiling insulation has been installed throughout the whole house.
- Windows in the kitchen/living space have been replaced with double-glazed windows.
- Domestic greenhouse gas production has been 100% offset by purchasing green power with an Origin Energy Greenearth account since January 2010. Green power is sourced from renewable energy sources such as solar and wind and is more expensive, but increased prices have been reduced by a gradual decline in domestic electricity use each year as a result of increased awareness, changed behaviour, and improvements such as double-glazed windows in the kitchen and insulation throughout the house that have reduced the need for heating in winter.
- The amount of orchard was increased by approximately 20% with the planting of a new orchard in 2009/10; these new trees were added to the carbon sequestration figures in 2010/11 even though they are still young and not sequestering as much as a mature tree, as sequestration figures for orchard trees are averaged over the assumed 15 year life-span of the tree.

Other factors affecting our emissions are more difficult to understand:

- A dramatic jump in domestic electricity use from 9,853 kWh in 2007/08 to 14,430 kWh in 2008/09.
- A 25% increase in domestic fuel usage from 4,104 litres 2009/10 to 5,160 litres in 2010/11.

2.5. PRACTICES AND CHANGES WE IMPLEMENTED BEFORE 2009 TO BECOME MORE SUSTAINABLE AND ENERGY EFFICIENT IN THE BUSINESS

- Started using biological farming techniques, especially compost and compost tea to increase biological activity in soil.
- Encouraged customers to use their own recycled bags, and changed our packaging to include
 - paper bags made from 100% post-consumer recycled paper (free),
 - re-used fruit and vegetable boxes for mail order, and
 - completely phased out the use of plastic bags to sell our fruit in.
- Participated in a compost trial comparing the efficacy of compost, compost tea, and no treatment in promoting soil moisture-holding capacity.

⁹'Managing the Carbon Cycle' Katanning Workshop. 21–22 March 2007.

- Started a worm farm which processes waste paper and some fruit, and produces high-quality compost tea starter and vermicast for the vegetable garden.
- Completely stopped using artificial fertilizers (even organic ones).
- Implemented soil moisture monitoring and timers to minimize water use.
- Started to use re-usable boxes for most fruit picking, storage, and transport to farmers markets.
- Re-used cardboard boxes for fruit storage and packing, replacing liners as required to ensure fruit hygiene.
- Stopped all use of chemicals.
- Stopped all use of copper sprays as fungicide (though allowable under organic certification) as the copper builds up in the soil and acts as a soil fungicide, working against our biological farming practices.

2.6. PRACTICES AND CHANGES WE IMPLEMENTED BEFORE 2009 TO BECOME MORE SUSTAINABLE AND ENERGY EFFICIENT IN OUR HOME

- Put a 4-minute timer in the shower and encouraged the family to use it.
- Changed to energy efficient light bulbs in the house and shed.
- Checked that the hot water, fridge, freezers, and heaters are working at optimal temperatures.
- Encouraged the males of the house to pee outside.
- Turn off lights and appliances when not in use.
- Make our own clothes washing liquid.
- Grow as much of our food as possible, and swap fruit with neighbours for food we cannot supply ourselves.
- Make ethical food buying choices (organic, free-range, sustainable).

2.7. HOW WILL WE ACHIEVE FURTHER EMISSIONS REDUCTIONS BY 2014?

We intend to implement some or all of the following changes to further reduce our carbon footprint:

- Install a solar hot water system.
- Reduce household energy consumption by making the family and visitors more aware of our daily energy consumption, e.g., by writing the daily figure on a whiteboard in the kitchen, in an attempt to link behaviour with consumption information.
- Continue to make our house more energy efficient: more double-glazed windows, door seals, porch at back door, seal fireplaces in bedrooms, double glazing in bedrooms, replace appliances (e.g., washing machine) with more energy efficient models.
- Investigate building a solar oven to access free energy for some cooking.
- Increase amount of carbon sequestered into the soil through biological farming techniques.
- Develop non-orchard land use on the farm for maximum carbon sequestering, through revegetation, cropping, and/or stock.
- Investigate wind power to supply some of our electricity needs.
- Investigate an electric car.
- Make good any places where a draught can get in (this is one of the most important energy savers in an old draughty house like ours as they can dramatically speed up the number of room changes of air/hour, increasing the need for heating; this can be responsible for up to 12% of heat loss).
- Securely seal unused fireplaces to prevent heat escape.

- Put proper curtains and pelmets on all windows.
- Insulate windows with clear plastic film.
- Insulcoat the roof (this can reduce heat transfer into the building by up to 20°C).
- Make modifications to the to save energy, i.e., find and fix leaks, weatherproof.
- Consider replacing the chiller with more energy efficient coolroom.
- Replace the petrol pump at the holding dam with a more powerful diesel pump, which would allow us to water the entire orchard at one time. This would save an estimated 4–6 hours of our time per week in the irrigation season, reduce running time of the pump saving fuel and greenhouse gas production. Diesel is a more efficient fuel than petrol, so this would also reduce our greenhouse gas production.
- Make our irrigation system more efficient by replacing the existing 50mm pipe with a larger diameter pipe (80–90 mm) to reduce friction, improve efficiency, and further reduce pumping times.
- Convert the cherry picker to run on batteries rather than petrol (this will be quieter and more pleasant to work with, remove the smell, and produce less greenhouse gas).
- Buy a chipper and chip prunings instead of burning, thereby keeping the carbon on the property and returning it to the soil.
- Continue to implement the permaculture plan for the property, including a pergola outside the kitchen window and deciduous creepers to maximize shade from summer sun and allow winter sunshine in, a porch outside the kitchen door to provide an airlock, and plant and landscape around the house to divert wind away from the house, to help maintain steady temperatures in all seasons.
- Investigate domestic wind and/or solar energy production.
- Investigate new technology to make house and business more carbon and energy efficient.
- Replace one of our vehicles with a hybrid/electric vehicle.

2.8. HOW WILL WE EVALUATE OUR PROGRESS?

- We will perform a carbon audit each year to check our progress towards becoming carbon neutral.
- We will annually update and review our sustainability plan to ensure it records our progress and reflects changing personal and global circumstances. The plan needs to incorporate new ideas and new technologies as they become available.
- We will monitor our water use, income, and expenses each year.
- Regularly test our soil to monitor soil carbon levels.

2.9. BEING CARBON NEUTRAL: CARBON OFFSETS

Our net total emissions were 15.31 tons in 2008/09, 17.72 tons in 2009/10, and 0.96 tons of carbon in 2010/11. To be carbon neutral we will buy carbon credits equal to the amount of carbon we emit. When we first wrote our sustainability plan in 2008, we decided to buy them from the Regional Resource Recovery Centre at the Southern Metropolitan Regional Council in Western Australia—this is a large waste recovery centre that sells carbon credits for avoiding methane production by diverting household waste into compost production. The facility is accredited with the Greenhouse Friendly program, but what really interested us is that the compost generated is then sold back to farmers and landholders and goes back into the soil—any resulting increases in soil health and soil carbon are not included in the

carbon accounting, but as far as we are concerned they are equally as important (if not more so) than the avoidance of methane generation that we are paying for.

To balance our carbon equation, we have again decided to buy credits equal to the net amount of CO₂ we emitted in the 2009/10 and 2010/11 financial years, i.e., 10.71 tons. As the process of calculating our carbon equation is not accredited, we are not claiming carbon-neutral status for our business. However, we feel that by including our domestic greenhouse gas emissions in our footprint, and by buying genuine carbon offsets, we can legitimately claim to be a **carbon-conscious business**.

The Carbon Farming Initiative will hopefully bring opportunities and methodologies for farmers such as ourselves to undergo accreditation for the sequestration of carbon through farming activities, including soil carbon. We are hopeful that the prospect of generating carbon credits through farming activities will act as incentive for farmers to adopt more sustainable farming practices, and add a new income stream to their farming enterprises. In future years we hope to gain accreditation as a truly carbon-neutral farm enterprise; however, if we were able to generate accredited carbon credits we would first use them to offset our own carbon footprint before considering entering the carbon market.

3. BUSINESS ANALYSIS

3.1. MARKETING AND TRANSPORT ANALYSIS

In writing our original sustainability plan we first discussed and agreed on the following principles:

- As a priority we sell our fruit locally, i.e., in the same water catchment as the fruit is grown.
- We choose not to export fruit.
- We maximize the profit from our fruit and minimize the energy required to sell it.

We then undertook a full analysis of the marketing and transport of our fruit to various markets, and implemented the following strategy:

- send the highest quality fruit to Melbourne Wholesale Markets, to be sold by our agents, Biodynamic Marketing, after first consulting with them about supply and price;
- sell fruit weekly at our most regular local market, Wesley Hill Market in Castlemaine, for the entire season;
- attend our most local farmers markets (Castlemaine and Bendigo) for the entire season;
- if we have enough fruit available, attend the farmers markets in Melbourne that have proved to be most profitable for us, i.e., Collingwood Children's Farm and St Kilda Farmers Market;
- sell cherries via pick-your-own; and
- sell mail-order fruit via our website.

This strategy has continued to work well for the last three seasons with little modification. After the loss of a considerable number of cherry trees in the extremely wet spring of 2011, we may have to reconsider whether offering pick-your-own remains viable. This will be reassessed after the 2011/12 season. The mail-order fruit sales works well for wholesale customers but is fairly inefficient in terms of return for time on the retail sales. We have decided to continue to offer this service without specifically promoting it, as it fills a need for our customers, who are often looking for a particular variety of fruit.

3.2. PACKAGING

Guiding us in our decisions about packaging are the following principles:

- Packaging should be minimized and not provided wherever possible.
- Packaging should serve more than one purpose if possible, e.g., paper bags should also act as our 'brochure' or business card through application of an informative stamp/label.
- Any printing will be with vegetable dyes to allow composting after use.
- We will recommend ways to re-use our packaging.
- When we provide packaging it will be as environmentally sustainable as possible, e.g., any new products (boxes, paper bags) will be recycled materials (made from post-consumer waste where possible) or made from sustainable and renewable resources (e.g., corn-starch bags).
- We will continue to seek low-carbon alternatives to any plastic packaging we use, e.g., liners for cherry cases, pallet wrap, plastic inserts for peach trays.

For **retail sales**, customers either provide their own bag or we provide 100% post-consumer recycled paper bags (for free) or re-used boxes. For **pick-your-own**, plastic bags have been replaced with corn-starch bags. For **mail-order**, we re-use clean fruit and veg boxes if available, otherwise 100% recycled (post-consumer) boxes are used, and lined with clean, shredded office waste. Re-used boxes are labelled to explain why we are using a re-used box. For the wholesale market, boxes are 100% recycled (post-consumer if possible), and labelled to reflect our carbon-neutral status.

3.3. KEY PERFORMANCE INDICATORS

In order to track our performance over the years, we have chosen a number of key performance indicators (KPIs). To put these figures in context, it is important to consider a number of significant events (weather and other) that have detrimentally affected production over the last 3 years.

3.3.1. Factors influencing production

Rainfall(mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2008								70.6	17.8	13.8	71.4	55.8	490.6
2009	0.0	3.0	2.5	27.2	23.6	72.4	85.2	80.2	85.8	40.6	87.1	30.9	560.9
2010	13.4	55.0	138.6	58.8	54.0	85.6	60.0	132.2	97.0	175.6	187.8	65.4	1,123.4
2011	196.8	120.8	36.4	56.8	43.0	40.0	57.6	65.8					
AVERAGE	47.3	41.2	36.3	50.1	65.2	68.3	71.9	79.6	68.9	68.5	55.1	41.5	705.3

2008/09 season

- This was the last year of the long drought, with extremely low rainfall throughout the growing season (August–May) except for November and December, which both had above average rainfall, leading to splitting in the cherry crop.
- After many years of drought and only 30%–35% water allocations for the 3 previous years, the trees were extremely stressed, had not grown well, and had few fruit buds, so harvest volume was considerably lower than the year before. This was a widespread phenomenon in the local fruit industry, with 2008/09 harvest volume being on average about 50% of normal throughout the district.

- We began the irrigation season too late, not realizing how dry the ground was, leading to fruit being smaller than usual, and not responsive to thinning (because the cell division was limited at flowering time by insufficient ground water).
- There was a plague of musk lorikeets that did considerable damage to the apple and pear crop, and minor damage to the peach crop.

2009/10 season

- High rainfall in winter and spring 2009 (for the first time in many years) caught us by surprise, and we did not have a budswell spray on the peaches and nectarines, which led to a bad curly leaf outbreak, and a bad blossom blight outbreak in the apricots.
- High rainfall in November also led to significant splitting in the cherry crop.

2010/11 season

- Excessively high rainfall from August 2010 right through until March 2011 had drastic consequences. We were prepared for wet conditions and were able to get one budswell spray on the peaches and nectarines, however both the orchard and the weather were too wet to allow us to put another spray on, so we had another curly leaf outbreak, though not as bad as 2009/10.
- Blossom blight in the apricots was much worse than 2009/10 and almost wiped out the entire crop. Those few apricots that did set were destroyed by rain when almost ripe.
- Very high rainfall in November again resulted in significant splitting in the cherry crop, and the cherry block stayed wet for so long that around 20% of the trees died due to waterlogging.
- The driveway and car park were so badly affected by the continuous rain that we could not open to the public until mid-way through December, and opened for 2 weeks only.
- All cherries picked before we opened for pick-your-own were sold at markets and the wholesale market, leading to higher costs for packaging, and taking a lot of time, which delayed the thinning of other crops.
- High rainfall in January and February led to brown rot outbreaks in the peaches, nectarines, and a number of varieties of plum, further reducing the amount of harvestable fruit.
- The young block of 1,200 trees (peaches, nectarines, apricots, and plums) that we planted in winter were affected in various ways by the wet conditions—mainly the peaches and nectarines were so badly affected by curly leaf that a number of trees died.

3.3.2. Profit and loss

In line with our value of being profitable and financially secure, our profit figure is an important business viability indicator. While the farm has continued to be profitable throughout the worst environmental conditions faced by the district in generations, it does not provide financial security for our family, nor does it provide adequate return for labour for either Hugh or Katie. Financial security comes from Hugh’s off-farm income, which adds time pressure to our working lives, as Hugh juggles dual roles, and Katie does the bulk of the farm work to enable Hugh to work in the office. However, the 2010/11 profit figure was a substantial improvement, and (extreme weather conditions notwithstanding) we predict markedly increased profitability over the next 5 years as young orchard matures and starts to bear.

Item	2008/09	2009/10	2010/11
Income	85,611	53,682	66,021
Expenditure	60,842	39,899	34,895
Profit (Loss)	24,769	13,783	31,127

3.3.3. Satisfaction index

To measure whether our business delivers results in line with our principles, we have devised a way to measure our job satisfaction. Each statement is given a score from 1 (not true at all) to 10 (completely true), then the scores added and averaged to come up with an overall indicator of satisfaction.

Indicator	Hugh	Katie
I enjoy my work	7	8
I have appropriate balance between work and other aspects of my life	5	7
My work is meaningful to me	8	10
My work is good for me physically	8	5
I am happy with the amount of money I make for the hours I work	3	1
I am happy with the environmental impact of my work	8	10
SATISFACTION SCORE	39/60	41/60

These scores are lower than either of us would like, mainly because of the financial underperformance of the business over the last few years. We expect this to improve over the next few seasons, if weather return to a more “normal” pattern, and as young trees mature and come into production. This is a very significant issue, and our future on the farm is dependent on the financial returns from the business improving. The other issues are Hugh’s lack of balance between work and other aspects of life, and Katie’s dissatisfaction with the physical toll taken by her farm work. Both of these issues are under discussion with a view to improving them in the future.

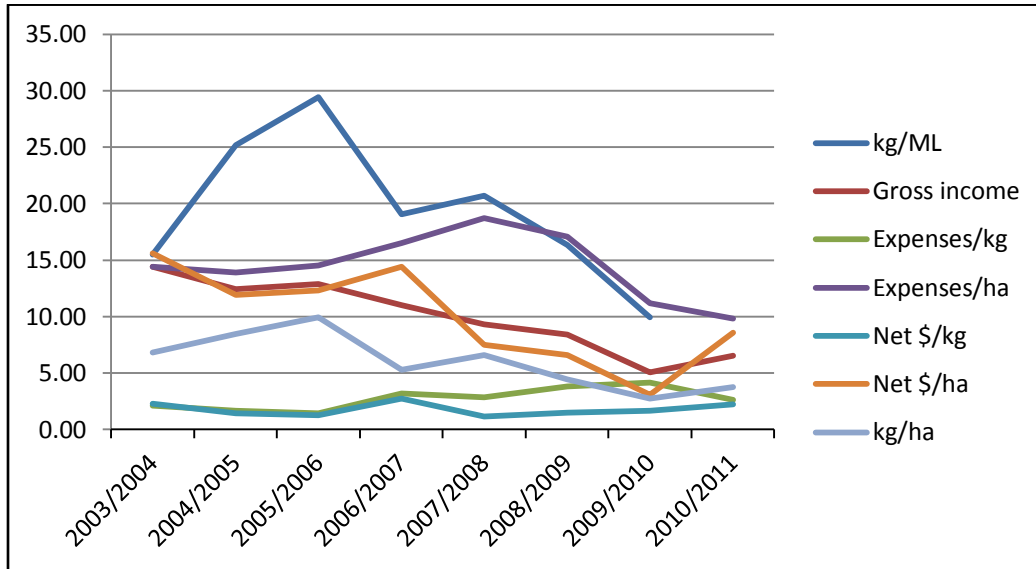
3.3.4. Production key performance indicators

A new 1.2 ha block of 1,200 trees was planted in winter 2010, however this block will not be added into the production figures until the first crop is picked (estimated to be 2011/12 season).

Data	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
Volume of fruit picked (kg)	32,656	40,761	47,671	18,537	23,468	15,881	9,647	13,432
Irrigation water used (ML & %, 100%=32.4)	21.06 ML (65%)	16.2 ML (50%)	16.2 ML (50%)	9.72 ML (30%)	11.34 ML (35%)	9.72 ML (30%)	9.72 ML (30%)	0 ML (0%)
Area of orchard (ha)	4.8	4.8	4.8	3.56	3.56	3.56	3.56	3.56
Gross fruit income(\$)	143,908	124,199	128,909	109,961	93,273	84,311	50,846	65,620
Expenses (\$)	69,001	66,723	69,745	58,761	66,733	60,842	39,899	34,895
Net income (\$)	74,906	57,475	59,163	51,199	26,540	23,469	10,947	30,725
KPIs								
kg/ML	1,550.6	2,516.1	2,942.7	1,907.1	2,069.5	1,633.8	992.5	...
kg/ha	6,803.3	8,491.9	9,931.4	5,207.0	6,592.1	4,460.9	2,709.8	3,773.0
Gross income/kg(\$)	4.41	3.05	2.70	5.93	3.97	5.31	5.27	5.20
Gross income/ML(\$)	6,833.2	7,666.6	7,957.3	11,312.9	8,225.1	8,673.9	5,231.1	...
Gross income/ha(\$)	29,980.8	25,874.8	26,856.0	30,887.9	25,919.4	23,682.9	14,282.6	18,432.6
Expenses/kg(\$)	2.11	1.64	1.46	3.17	2.84	3.83	4.14	2.60
Expenses/ML(\$)	3,276.4	4,118.7	4,305.2	6,045.4	5,884.7	6,259.5	4,104.8	...
Expenses/ha(\$)	14,375.2	13,900.6	14,530.2	16,505.9	18,745.2	17,090.4	11,207.6	9,801.9
Net income/kg(\$)	2.29	1.41	1.24	2.76	1.13	1.48	1.65	2.22
Net income/ML(\$)	3,556.8	3,547.8	3,652.0	5,267.4	2,340.4	2,414.5	1,126.2	...
Net income/ha(\$)	15,605.4	11,973.9	12,325.6	14,381.7	7,455.1	6,592.4	3,075.0	8,630.6

... = data not relevant; excessive rainfall resulted in 0 ML irrigation water used

The following chart of selected KPI shows the trends over the last 8 years quite clearly.



The major indicators, such as kg/ha, gross income, net income/ha, and net income/kg all follow the same pattern, i.e., they declined from 2003/04 to 2009/10, and then started to increase again. In summary, this is due to increasingly bad drought conditions for 6 years, followed by two extremely wet years, plus a host of other adverse events along the way. Added to this we have been pursuing a program of orchard renewal and replanting since 2005/06, which means we have had a high proportion of trees in the orchard that are less than 5 years old, and therefore not in full production.

We are confident that (adverse weather conditions notwithstanding), all of these indicators should increase each year for at least the next 5 years, though the loss of approximately 20% of the cherry block in 2010 due to wet conditions will have an effect.

The chart also shows that expenses/kg and expenses/ha followed the reverse trend, gradually increasing each year until 2009/10, when they started to decrease again. This is due to a number of factors, including joining the WWOOF (Willing Workers on Organic Farms) program, which has reduced our labour expense; lower packaging costs due to smaller volumes of fruit being handled; and reduced advertising costs due to switching more to electronic marketing.

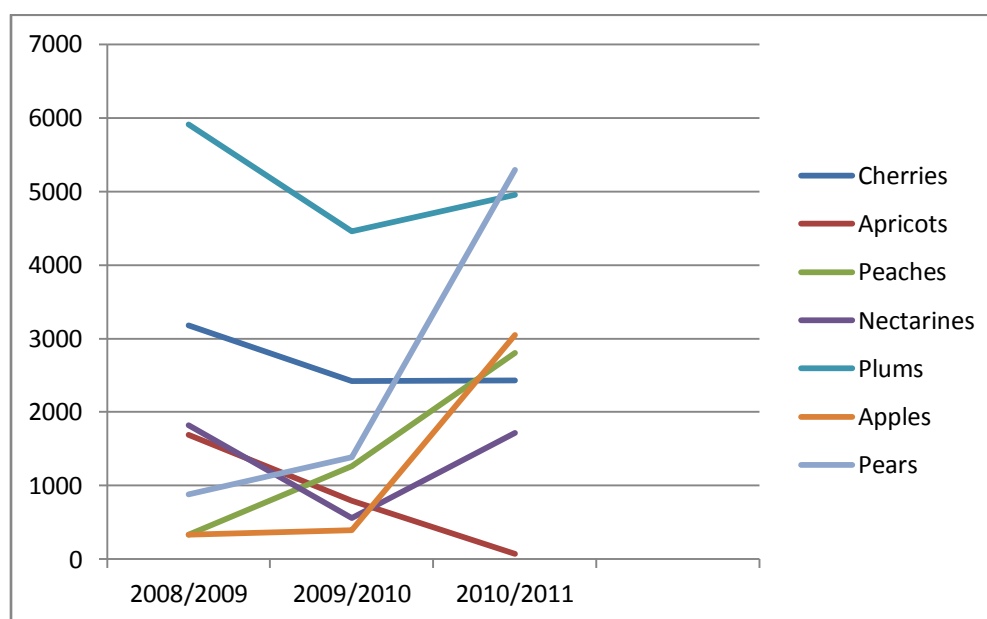
To assess the value of growing different types of fruit, we have compared data for the last 3 years by fruit type. Data has been collated in an Excel document, converted into hectare equivalents (even though we grow less than 1 ha of most types of fruit), and is presented in the following chart.

Crop	kg/ha			\$/kg			\$/ha		
	08/09	09/10	10/11	08/09	09/10	10/11	08/09	09/10	10/11
Cherries	3,176	2,425	2,434	...	9.26	10.93	40,152	22,466	26,606
Apricots	1,689	797	74	...	6.28	6.09	21,489	5,005	449
Peaches	331	1,265	2,804	...	6.27	4.81	26,375	7,931	13,507
Nectarines	1,823	564	1,719	...	4.70	3.62	12,190	2,625	6,225
Plums	5,908	4,461	4,954	...	4.07	2.94	5,137	18,174	14,603
Apples	331	391	3,044	...	5.87	4.77	1,606	2,293	14,519
Pears	883	1,383	5,289	...	3.83	3.30	1,356	5,300	17,467
Total	4,461	1,945	2,708	...	5.80	4.96	23,682	11,163	14,603

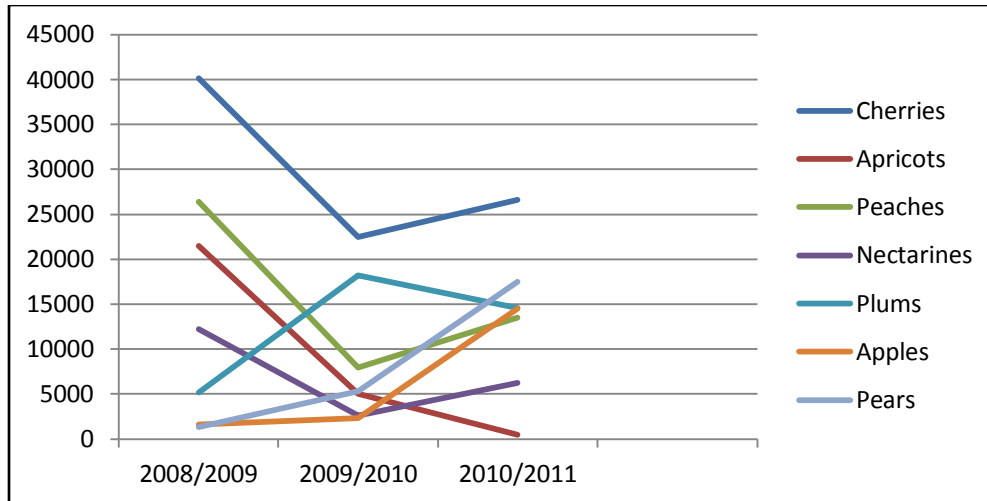
... = data not available due to corruption of computer data file

The following chart compares the number of kilograms produced per hectare by each fruit type:

- Apricots have declined dramatically, mainly because of issues with blossom blight.
- Cherries are also vulnerable to environmental conditions and have declined.
- Plums declined because some varieties were grafted; production has started to increase.
- Peaches and nectarines have started to recover from two wet springs.
- Apples and pears are rapidly increasing as young trees mature and start to bear fruit.



The following chart compares the amount of money made per hectare by each fruit type. Cherries are risky, but still the most lucrative crop to grow, while apricots are the most risky and the least lucrative!



3.4. SUMMARY OF FACTORS AFFECTING EACH FRUIT TYPE

3.4.1. Cherries

The cherry crop has suffered extreme losses due to rain over the last 3 years, and in 2010/11 conditions were so wet that about 20% of the trees in the block died. The 2010/11 season showed a slightly higher return despite the crop being about the same size due to a slight increase in return (\$/kg). We expect a much smaller crop in 2010/11.

3.4.2. Apricots

The crop was severely impacted by blossom blight as a result of the wet spring of 2009/10, and almost completely destroyed by the wet spring of 2010/11. Attempts to control blossom blight with lime sulphur in the spring of the 2011/12 season have not been completely effective, resulting once again in some crop loss.

3.4.3. Peaches and Nectarines

The wet spring of 09/10 resulted in a severe curly leaf outbreak and a substantial reduction in harvest volume (kg/ha) and income (\$/ha). The outbreak was so bad that some trees and a substantial number of limbs died back, leading to a marked reduction in the amount of productive wood in the orchard. Despite the extremely wet spring of 2010/11 curly leaf was much better controlled, and harvest volume (kg/ha) and return per hectare (\$/ha) at least doubled, though still fell a long way short of 08/09 figures. The trees grew strongly in 2010 and have started to replace the wood lost to curly leaf. We expect further increases in all KPIs for peaches and nectarines in the 2011/12 season.

3.4.4. Plums

As grafted trees have come into production over the last few years, harvest volume (kg/ha) has increased. This has been offset by lower returns (\$/kg), which is reflected in a lower return per hectare (\$/ha). Some varieties were affected by brown rot as a result of the extremely wet conditions in the 2010/11 season, leading to a smaller than expected increase in harvest volume (kg/ha) and a downgrading in quality leading to a reduced return (\$/kg).

3.4.5. Apples and pears

Young apple and pear trees have started to come into production, with substantial increases in kg/ha and \$/ha as expected. Again, having larger volumes to sell tends to result in a lower \$/kg value.

3.5. WATER, SOIL MANAGEMENT, AND SOIL TESTING

We own a water right from Coliban Water of 32.4ML, and in the years before the drought used the full allocation to grow our crop. Between the 2003/04 and 2009/10 irrigation seasons, we experienced increasingly dire drought conditions, and severe water restrictions (see the production KPI table in 3.3.4). In 2010 the drought broke and we had an extremely high rainfall year, with 100% allocation, that ironically we didn't use at all, relying totally on rainwater for our irrigation purposes.

Despite practicing greater water efficiency, we have struggled to maintain the volume of fruit we grow per ML, as the steady decline of the kg/ML KPI since 2006/07 demonstrates. This is largely due to the fact that harvest volume is affected by many factors other than the amount of water used to grow the crop, including frost, hail, bird damage, and reduced vigour of trees due to ongoing drought conditions.

Our soil improvement program in the orchard aims to re-establish the soil biology and create an active soil food web. We have replaced all artificial fertilisers (including organic fertilisers) with an annual program that consists of one application of compost (45 tons/year, at 9 tons/ha), three applications of compost tea, and at least three applications (via fertigation) of fish, kelp, and humates.

We have been applying this program for 5 years, and have gradually increased the water-holding capacity of the soil. As noted in 3.3.4, the KPI of kg fruit/ML of irrigation water used was rendered useless by the fact that no irrigation water was used in the 2010/11 season because it didn't stop raining! Our evidence for improvement in water-holding capacity is therefore reliant on the results of a test done in 2011 by students participating in a Department of Primary Industries Young Scientists program. Our soil was tested and compared to soil from a conventional orchard nearby in Harcourt. The results showed that water-holding capacity of the soil from the conventional orchard was 0.22 grams of water held in each gram of soil, and the water-holding capacity of our soil was 0.55 grams water held in each gram of soil.

Hugh remains a member of Coliban Water's Harcourt Water Services Committee, which has a brief to oversee the reconfiguration of the Harcourt Main Channel, which delivers irrigation water to the Harcourt valley. Our irrigation water supply is currently via this leaky and inefficient concrete channel system supplemented by a temporary pipe, and Coliban Water has committed to replacing it with a permanent low-pressure piped system, which has been held up by bureaucratic red-tape. The new system will improve the efficiency of water delivery to Harcourt irrigators, which may offer us more water security than we currently enjoy, though irrigation water security will still depend on the amount of inflows to the Coliban system and the potential to connect to another system that can provide us with water.

We have done a number of soil tests since 2004, all with different laboratories. The same blocks have been tested each time, i.e., the cherry block, house block, and peach block. A wide range of macro and micronutrients are tested, however a good sign of soil fertility is carbon, and the soil carbon results are presented in the table below.

Soil carbon levels from soil test results(%)

Year	Lab	Cherry block	House block	Peach block	New block
2004	Nutrient Advantage	2.1	1.7(apples)	2.0	
2006	CSBP	2.3	1.5 (apricots)	1.9	
2009	Sydney Environmental & Soil Laboratory				0.89
2010	Environmental Analysis Laboratory	2.1	2.0 (apples)	1.5	

In September 2009, before planting our most recent orchard (in 2010), we sowed a green crop consisting of Blue Ace lucerne (10kg), three types of clover (Strawberry, Balansa, and Arrowleaf, 2kg each), borage (100gm), chicory (100gm), hyssop (10gm), and yarrow (20gm). Despite drought conditions when it was sown in 2009 and flood conditions in 2010, this has been an extremely successful strategy, establishing a perennial cover crop of largely nitrogen-fixing clover throughout the orchard. We also used weed mats when planting the trees, and these were also very successful, maintaining a weed-free space under the mat even when the mats themselves were completely overgrown.

There are a number of weeds throughout the block, such as patches of wireweed, widespread plantain and drooping Cassinia. Cassinia is an excellent early succession plant, helping to repair damaged soil, and we have only removed it (by hand) where it is growing next to a tree as it can become quite a large bush. There is no tall grass at all in the block, and we have not yet needed to mow this orchard; fewer tractor passes means less compaction of soil and savings in both fuel and time, and therefore dollars.

Orchards planted before this time did not use this strategy, and while they have good perennial ground cover, this includes problem grasses such as paspalum and other tall and invasive grasses, that require mowing several times a year. However, after applying a program of compost, compost tea, and biology food for the last 5 years, these grasses are gradually succeeding to a mix of clover, medics, and perennial grasses, which provide more nutrition for the trees and require less mowing.

3.6. PEST AND DISEASE REVIEW

Pest and disease issues have been a major cause of loss of harvest volume and profit over the last several years. The following table identifies problems, discusses causes and includes remedial action taken or planned.

Pest or disease	Impact in recent seasons	Why is it a problem?	Remedy	2011/12 Plan
Pear and cherry slug	Leaf loss in second half of growing season (post-harvest) reduces tree growth and vigour, resulting in less new bearing wood. Probably contributes to overall decline in harvest volumes.	Pear and cherry slug has gradually increased across the block since the exclusion netting was first put up, possibly initially due to exclusion of bird predators.	Winter oil Oil sprays (can't use on hot days or burns) Spinosad (organic chemical)	Spinosad if required
Earwigs	Cherries – moderate Apricots - severe in some varieties, mild to	Control not as good as it could be due to late application of double-sided tape, failure to	Control weeds and apply double-sided tape much earlier than usual (i.e., September)	Double-sided tape if crop size justifies the expense

Pest or disease	Impact in recent seasons	Why is it a problem?	Remedy	2011/12 Plan
	moderate in most White nectarines - can be severe	control weeds around tree butts (giving earwigs an alternative route into the tree), possibly also resident populations of earwigs in and around the tree. Earwigs start hatching in winter, and probably get into the trees in early spring.	Continue to control weeds around the tree butts throughout the harvest season by mowing and whipper-snipping	Weed control
Curly leaf	Peaches and nectarines - extremely severe	No control applied due to concern about high copper levels in soil	Good orchard hygiene - removing and burning diseased wood Winter oil Two copper sprays at budswell (sulphur as alternative)	Hygiene Lime sulphur – largely successful in 2011/12 season
Brown rot	Peaches and nectarines - mild in mid- to late-season varieties	No control due to low crop levels	Good orchard hygiene - removing and burning diseased wood and mummified fruit Sulphur as required in response to wet conditions	Orchard hygiene Sulphur as required throughout season
Blossom blight	Apricots - extremely severe in Apricot Block (no crop), moderate to severe in some varieties in House Block, mild in other varieties	No control applied due to the concern about high copper levels in soil	Good orchard hygiene - removing and burning or slashing diseased wood Winter oil Copper sprays in spring (sulphur as alternative)	Two sprays of lime sulphur – not very successful! Next season revert to copper
Birds	Moderate losses in Cherry Block (30%–50% in some varieties), moderate to severe losses in peach and nectarine block (losses magnified due to small crop)		Drape netting Enclosure netting Scare gun Electronic tweeter	Use drape netting if size of crop justifies Tweeter

3.7.CROP PROJECTIONS FOR THE 2010/2011 SEASON

Crop	kg	\$/kg	Gross income(\$)
Cherries	1,200	10	12,000
Apricots	200	6	1,200
Peaches	2,250	5	11,250
Nectarines	800	4	3,200
Plums	6,000	4	24,000
Apples	2,000	5	10,000
Pears	1,200	3	3,600
Total	13,650		65,250

4. BACKGROUND TO THE PLAN: WHAT HAS INFORMED US?

4.1. WHO ARE WE INSPIRED BY?

- Each other!
- The many people doing exciting and innovative work in the fields of biological farming, organics, and soil carbon sequestration, including:
 - Michael and Louisa Kiely, Carbon Farmers of Australia, <http://www.carbonfarmersofaustralia.com.au/CarbonFarmers/index.html>
 - Dr Elaine Ingham PhD, <http://www.soilfoodweb.com.au>
 - Dr Arden Andersen, author of *Science in Agriculture*, <http://ardenandersen.blogspot.com/>
 - Dr Christine Jones. Katanning Workshop.21–22 March 2007. Australian Soil Carbon Accreditation Scheme (ASCAS), Managing the Carbon Cycle
 - Dr Maarten Stapper, Director, BioLogic AgFood.
- Jane Knight for her teaching program Footprints to Sustainability, which provided the impetus and much of the information for our original sustainability plan.
- Beck Lowe from Cydonia Permaculture for her inspirational and down-to-earth permaculture training.
- All the farmers, scientists, and educators teaching and practising biological farming.

4.2. USEFUL LINKS AND RESOURCES

- <http://www.carbonfarmersofaustralia.com.au/CarbonFarmers/index.html>
- <http://www.carbonoffsetguide.com.au/providers> – a handy website put together by the EPA and RMIT that lists carbon offset providers. Gives information about accreditation bodies and processes for carbon offset providers to help decide which to choose.
- <http://www.climatechange.gov.au/greenhousefriendly/index.html> – lists some carbon offset providers and explains accreditation process for the Australian Government’s Department of Climate Change ‘Greenhouse Friendly’ program.
- <http://www.vecci.org.au/professional+services/grow+me+the+money/index1.asp> – Sustainable business assessment and accreditation process
- <http://www.whitedogcafeoundation.com/about.html> – inspiration plus on where a successful, sustainable business can take you
- <http://www.abc.net.au/science/slab/natcap/default.htm> – examples of world leading business
- <http://www.rmi.org/> – a think tank with amazing ideas
- <http://www.treehugger.com/> – a mine of green info
- <http://www.green.tv/> – great tv clips
- http://www.youtube.com/watch?v=o_MDRI-Q76o – Fritjof Capra talking
- <http://www.epa.vic.gov.au/GreenhouseCalculator/calculator/default.asp> – Greenhouse calculator
- <http://www.sunlizard.com.au> – cool sustainable temperature modification for your home
- <http://www.comfortheat.com.au/heatmat.htm>

- <http://www.ata.org.au>
- <http://www.yourhome.gov.au>
- http://solarshop.com.au/main/category8_1.htm - [solar pumps](#)– you'd need to know the consumption of your current model
- <http://www.greenhousebalanced.com/who-we-are>– Paul Dettmann who does appropriate planting for offsets (though not accredited)
- <http://www.ncoc.us>
- <http://www.casmgs.colostate.edu/default.asp>
- <http://www.carboncoalition.com.au>
- Ricky James, Grapes Industry Development Officer, DPI Rutherglen, mobile 0447 341373, ricky.james@dpi.vic.gov.au – good resource for soil microbial work being done in grapes and vegies
- Edwards, J., Potter, I., and Imhof, M. Water & Vine: Managing the challenge. Module 13 – Soil health: what is it, how do we assess it and how do we improve it? Department of Primary Industries, 2009, waterandvine@gwrdc.com.au
- Carbon toolkits in agriculture newsletter, Sarah.Holland-Clift@dpi.vic.gov.au
- Install a water tank - check out the Save Water website <http://www.savewater.com.au/?eid=3519770> for advice on installing the right tank for you. (Remember, you might be eligible for a government rebate)
- Sign up to government-accredited GreenPower - check out Green Electricity Watch <http://www.greenelectricitywatch.org.au/?eid=3519770> for the best options in your state
- Put the funds towards installing insulation or a solar hot water system with the assistance of the government's Energy Efficient Homes Package <http://www.environment.gov.au/rebates/index.html?eid=3519770>
- If you're planning on upgrading appliances, remember to look for the stars and efficiency labels. Check out the Australian Conservation Foundation's shopping tips http://www.acfonline.org.au/default.asp?section_id=93&eid=3519770 and consumption atlas <http://www.acfonline.org.au/consumptionatlas/?eid=3519770> for more information.
- Green-It-Yourself website: lots of videos about how to green your own house
- <http://www.climatechange.gov.au/en/government/initiatives/national-carbon-offset-standard.aspx>