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Cherries in Central Otago - feasible or folly?

Cherries

An analysis of traditional and dwarf varieties and methods, for the Teviot valley, Central Otago.

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Executive summary

The general essence of this report was to establish whether cherries are a viable diversification on a sheep, beef and deer farm at Teviot in the Teviot valley (Roxburgh), Central Otago.

This document was also produced to assist others who may be thinking of establishing a cherry orchard and require a reference or starting point to start their investigations, giving them an overview of the present status of the industry.

This report aims to compare and analyse the cost structures and returns from traditional cherry growing methods as compared to newer dwarf or "Bonsai" type methods.

While researching this report it seemed obvious that growing dwarf cherries would seem to be a very viable alternative to the traditional cherry orchard given the possibilities of intensification with smaller trees and ease of management these trees allow. This is wholly dependant of course on good risk management of the orchard, high marketable yields and sound future financial returns.

Cherries are certainly not without some risk as is most horticulture and a key one looming especially in Central Otago is the chronic labour shortage during the summerfruit harvest window. Another issue would seem to be how cherry producers, dwarf and traditional together will deal with the increasing production of cherries that will result from the increase in recent plantings.

If you are able to sleep easy with these risk factors alongside weather issues then I would suggest that cherries could be a very good diversification option alongside traditional forms of pastoral farming.

This report sets out in relatively simple form the production parameters, cost and revenue projections, comparisons to other summerfruit and talks about the principles of root restriction and dwarfing cherries. This should hopefully give the reader an overview of where the cherry industry is at and help them on their way to deciding if cherries are an option for them.

This report was not intended to be the definitive guide to growing cherries but instead as a broad overview of all the different facets involved in the industry.

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Introduction

The author of the report had recently, (June 2003) purchased a property at Teviot, Central Otago, (Teviotdowns) and was keen to establish whether cherries could be a cash flow alternative to traditional sheep / beef products in an area that is prone to summer and autumn dry and consequently lower sheep / beef production.

The property, Teviotdowns, has a resource in an annual irrigation water allocation of 90000m3 that at present is under utilized by wild irrigation methods on approx 10 Ha of pasture.

Due to the geography of the property, i.e. steep, and the type of water delivery, (wild) irrigation of further pasture is deemed economically not viable, therefore intensification, with horticulture in mind, on the 10 Ha under the irrigation race would seem to be a viable alternative.

As the author has had no previous experience in horticulture he was starting at ground zero in terms of knowledge of the summer fruit / pip fruit industries and therefore decided to start with a high return / Ha crop.
Interest in cherries was also initiated after viewing a Country Calendar programme on dwarf or bonsai growing of cherries that could potentially intensify returns per ha with lower labour and capital costs.

The author would like to give special thanks to Earnscy Weaver and Fred Field who gave generously of their time and assistance in the collation of the information contained in this report.

Industry Background

Sweet cherries are believed to have originated from the area between the Black and Caspian seas of Asia Minor. Birds probably carried the seed to Europe prior to human civilization.
Cultivation was probably started by the Greeks and continued by the Romans.
Contemporary cherries are genetically very similar to the initial varieties.
Recent breeding programmes have produced modern cultivars with highly desirable characteristics, such as rain resistance, size improvement and seasonal spread.

Worldwide the plantings of cherries have increased dramatically, including in New Zealand, where the oldest trees date back 140 years. The market pays a premium for and is mainly focused on large / firm cherries.
Cherries also have a high content of the sought after antioxidant anthocyanin, (found in grapes and berry fruit also) so are sought after by the health conscious consumer.
Globally 93% of cherries are grown in the Northern hemisphere and 7% grown in the Southern Hemisphere. The total world export traded tonnage is approx 100000 tonnes annually, of which NZ exported 503 tonnes in 2002 and 712 tonnes in 2003, equating to 0.5% – 0.7% of the total trade. Total NZ production was 1220 tonnes / 2002 and 1000 tonnes / 2003.
The USA produces approx 120000 tonnes of sweet cherries annually.
One family owned packhouse in the USA processes the equivalent annual NZ production in 2 days.
Iran, USA ,Turkey and Syria account for approx 75% of the worlds cherry exports, (all Northern Hemisphere).
China has huge internal production but consumes all of its own production.
Chile is the biggest export competitor for New Zealand in the Southern Hemisphere with a large amount of US $ invested there in the cherry growing infrastructure, which is now producing high quality fruit. Australia is also competing for markets with NZ at the same time of year. The Adelaide cherry growing region of South Australia produces the annual equivalent of the total NZ production.

Summerfruit NZ estimates that in New Zealand the total area planted in Cherries, (as at 30th June 2002) was approx 550Ha, with the area planted to June 2003 estimated at approx 600 Ha, (no accurate data here due to confidentiality) compared to a total area of fruit planted of 53700 Ha. There is some debate over the actual area planted in cherries. Some say it could be as low as 400 Ha while 600 Ha has also been quoted.
Of this approx 60 ha was in the North Island, (34ha Hawkes Bay) and 490 ha was planted in the South Island, (350ha Central Otago and 110 ha Marlborough).
Production wise it equates to approx Central Otago 63% and increasing, Marlborough 30% and decreasing, Hawkes bay 5%.
Up until 1986 there was a static level of approx 200 Ha planted in cherries.

The New Zealand Fruit Growers Federation of New Zealand is the industry group that undertakes the broader generic issues for the whole fruit industry, representing approx 3600 growers. It deals with the issues of biosecurity, research, training, international relations etc and is funded by levies. It also works in conjunction with regional fruit

grower committees, affiliated fruit grower associations or product groups on a variety of issues that need a co-ordinated approach.
In the case of cherries this is Summerfruit New Zealand Incorporated, (SNZ)
SNZ is the recognized product group operating under the auspices of the Horticulture Export Authority (HEA).
Any export of fresh cherries, apricots nectarines, peaches or plums (together known as summerfruit) comes under the auspices of the HEA. The export programme is administered by SNZ, this includes the export marketing strategy (EMS).
Further details on export can be found later in this paper.

Research into the growing of dwarfing cherries started approx 20 years ago in New Zealand by Professor Richard Rowe in conjunction with Fred Fields. The emphasis of the research was to use root restriction as the method to "stunt" or shock the tree into producing less wood, thereby also stressing the tree and putting it into survival mode. The theory is that in this state the tree wants to reproduce to survive so uses its energy to produce and feed fruit, (seed) for reproduction, instead of producing excessive wood or leaves.

The result being that the grower is manipulating the trees and the orchard instead of the grower being controlled or managed by the orchard.
Commercial plantings of dwarfing cherries have only evolved on a larger scale in the last 5-6 years.
As at August 2003 there was approx 71000 dwarf cherry trees in commercial plantings in New Zealand, with the main cluster of these in the Oamaru area, although they are also as far south as Karitane and as far north as Hawkes Bay.

Hortresearch has also undertaken trials to identify types of cherry rootstock that show dwarfing characteristics, while being grown under traditional orchard methods.
Trials were undertaken between 1988 and 1995 at which time the trees were uplifted.

The management, physiology and production of dwarfing trees as well as HortResearch trials are discussed later in this paper.

Growing parameters

Soil

Cherries require a very free draining, fertile and pH neutral soil preferably a Sandy Loam or loamy texture. The free draining aspect of the soil cannot be overstated as they hate wet feet and will not produce fruit, and may in fact die under such circumstances. They also tend to be shallow rooted.

It is recommended at planting to deep rip your soil to assist drainage and to plant the trees flat on cultivated ground and to then mound the soil around the tree to assist in water run off around the root zone.

The ideal pH is in the range of pH 6.0 – 6.5. This is reasonably critical as at this level the nutrients that cherries need to produce are freely available. A lower pH that will usually occur in free draining soils will lock up many of the nutrients and trace elements they need to produce quality fruit.

It goes without saying that a $50 soil test is a very small investment in the health and production of any commercial crop be it fruit or grass.

Once trees are growing a leaf test should also be undertaken to identify any nutrient deficiencies that could still be occurring. The leaf samples should be taken from the first fully mature leaves back from the growing tip, with approx 50 leaves as a good representative sample.

Soil tests are the basis for your ground – based fertiliser applications and the leaf tests will determine any adjustments needed using foliar applications.

The soils on our Teviot property that would be suitable for planting cherries are Matakanui, defined as very shallow loam schist gravels. Recommended soil fertiliser values and the result of the Teviotdowns soil test are as below.

Fertility levels

Ideal soil values (MAF units)		Teviotdowns soil test (Quinphos)
Ph	6 - 6.5	5.7
P (Olsen)	15 - 35	22
K	10 - 15	6
Ca	10 – 15	8
Mg	20 – 30	27
Na	1 – 5	6
B	1 – 1.5 ppm	-
Zn	9 – 15 ppm	-
CEC (Cation Exchange Capacity)	10 – 22 meq	15

As the Matakanui soil is shallow and free draining it would seem to be an ideal medium for cherries, as long as we applied some Lime and Potassium based on the above soil test results.

Ideal leaf values

N 2.2 – 3.0%	P 0.15 – 0.4%
K 1.3 – 2.5%	Ca 1.0 – 2.5%
Mg 0.35 – 0.65%	Mn 20 – 200ppm
Fe 25 – 200ppm	Zn 15 – 100ppm
B 20 – 60ppm	

Climate

Given that over 60% of NZ cherries are grown in Central Otago we can guess that they require a very hot, dry and low humidity climate. This can fact is born out due to areas such as Marlborough and Hawkes Bay having increased problems of brown rot due to higher humidity levels, and in theses areas production is static or declining. Probably due to grapes and wine being more fashionable in these areas also.

Growing Degree Days (GDD's)

GDD's are a measure of the heat accumulation above a minimum threshold usually refered to as the base temperature. Most calculations for fruit use a base temperature of 10oC. There are several methods of calculating GDD's the easiest of which is the average method.
You take the average of the maximum and minimum temperatures each day and subtract the base temperature from the average. This gives you the GDD's for that day, and they are usually accumulated from the 1st October to 1st April.

Example; max 25oC and min 12oC with a 10oC base…..
(25 + 12) / 2 = 18.5 – 10 = 8.5 GDD's.

However anomalies can occur when you have a cloudy day at say 15oC and then the sun comes out for 15 minutes and the temperature climbs by 8 - 10oC causing a sudden spike on the graph giving a not so accurate picture of GDD's for that particular day.
The most accurate method is to install a data logger that takes automatic temperature readings every 30 minutes and can store up to 6 months data, this will smooth out any variations as in the average method. Cost approx $300 ea.

The growing degree days, (GDD's) required to produce quality cherries is 800+.
As a comparison apples require a min of 700 GDD's with grapes and olives needing 900+ GDD's.
Ideal growing temperatures are between 10oC – 30oC with temperatures above and below this range limiting growth.
Bees require 10oC + to fly and pollinate and you will need approx 1 hive / Hectare for 3 – 4 weeks at the flowering stage.

- The Teviot valley, (the author's residence) as part of the Grow Otago climate mapping project has been mapped as having annual GDD's of 800 – 850.

N.B. Beware of shiny shoed, forked tongued Real Estate agents selling high valued properties based on their GDD's as is happening in Central Otago now.

Irrigation

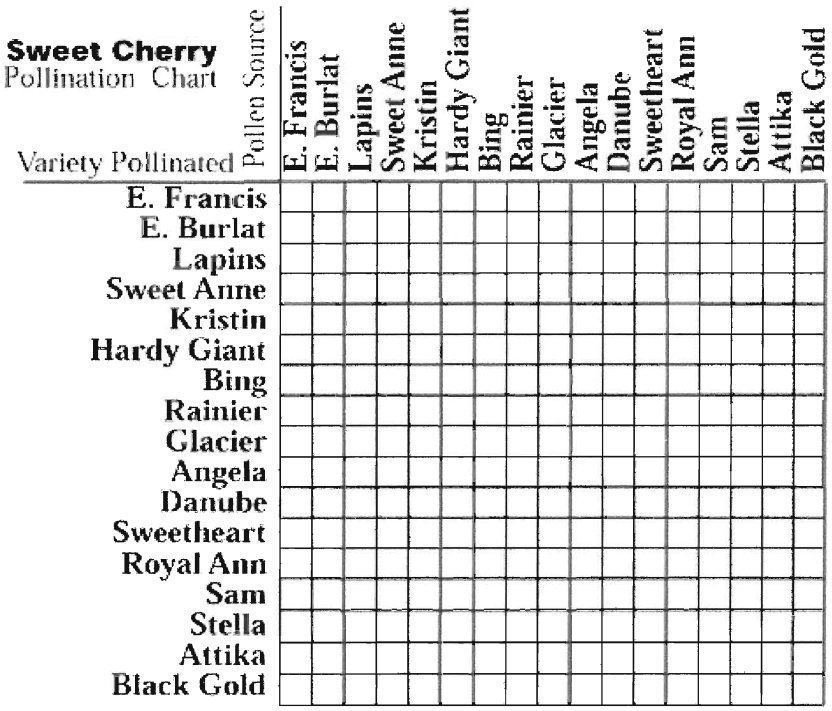
While cherries like a hot dry climate with free draining soil, most orchards in Central Otago do need irrigation. In most cases this is a combination of under-tree mini sprinklers as well as overhead sprinklers that are used for frost control and latterly also for the delivery of Calcium Chloride to help reduce splitting of the fruit. Most of the irrigating of the tree comes from the under tree sprinklers especially in the month before harvest as water on the cherries during this period, (from rain or sprinklers) will split the fruit. An average minisprinkler under-tree system will cost approx $4000 / Ha for the parts, not including storage or pump. Evapotranspiration rates in Central Otago will be in the order of 5-6mm / day, on average through the summer growing months.

Varieties

By far the most common rootstock used in orchards in Central Otago is the variety of Colt with Stella being the most popular clonal stock, (scion) being grafted on.
Stella is one of the main pollinating varieties and is commonly used as pollinator rows between other varieties also and it is a variety that handles being exported very well.
There is also now a Compact Stella variety, a smaller tree, not to be confused with dwarf cherries.
One of the biggest risk factors with cherries is labour, especially in Central Otago.
You can grow the most fantastic crop of cherries and given its fragile nature when it is ripe, if you don't have labour in place to harvest the crop you can sustain large marketable yield losses.
For this reason most orchards will plant a range of different cherry varieties to stretch out the harvest period and thereby flattening the labour demand curve.
While different varieties will all flower within a very short time frame they do vary considerably in harvest dates, as the comparisons below show.
The comparisons below are a good guide but caution should be used as unseasonably cool weather after flowering and then very hot weather during the pre-harvest can shorten up the harvest window between varieties.

Variety	Season	Harvest date
Burlatt	early	Late Nov/Dec
Earlisse	early	December
Roseann	early	Christmas week
Dawson	early	Christmas day
Stella	mid	Jan
Bing	mid	Mid Jan
Sonnett	mid	Mid Jan
Lapins	mid	Mid - late Jan
Sweetheart	late	Late Jan
Sweet Valentine	late	Early Feb

When you buy a cherry tree you are paying approx $1 - $2 per tree in royalties to the original breeder of that variety, but with Sweet Valentine you are now paying a production based royalty i.e., a % on a per kg harvested basis. Very clever that breeder!!!
See the chart below for cross pollination of varieties.



Otago Polytechnic Cromwell NZ.
Successful Cherry Production.

1. Where the intersecting lines are white, the variety will be pollinated.
2. Where the intersecting lines are shaded, the variety will not be pollinated.

Dwarf

Colt also makes up approx 70% of the rootstock used for dwarfing cherries
Again with Stella grafts but also Lapins are common and the variety of Royalton coming on stream soon which is known for producing larger fruit.
Cherry trees can be a problem to source so you need to plan ahead and order your trees well in advance, up to 18 months in advance.

Hortresearch trials

Robert Agnew and Rengasamy Balasubramaniam at Hortresearch in Marlborough under took trials between 1988 and 1995 to gauge the performance of the sweet cherry cultivar of Stella on new types of clonal rootstock. The various rootstocks were

evaluated with the objective of identifying if the chosen rootstocks had dwarfing characteristics.
The rootstocks used were all European varieties, German, Belgian and Italian.
While the research was to identify dwarfing characteristics, they also wanted to identify rootstocks with a high yield efficiency i.e., least height and canopy area relative to yield
The performance of the rootstocks was determined through mainly assessing those with the least height and canopy volume, the butt or trunk cross section, the fruit yield and the relationship between these measurements. These were expressed as the Yield efficiency 1, (Yield/Canopy volume in Kg/m3) and as Yield efficiency 2, (Yield/Butt Xsection area in g/cm2).
See the results ex Hortresearch attached at rear.
Conclusions of the research identified GM-79 (German) as the most dwarfing and production efficient rootstock in terms of yield per canopy volume @ 1.58Kg / m3 of canopy. A height of 4.3m and 8.7m3 canopy volume, not that small really.
However when yield per hectare was compared CER 11 and CER 13 (German) would produce 16.6 and 14.5 Tonnes / Ha at a tree density of 500/ Ha whereas GM 79 would need to be planted at 1000 / Ha to produce 13.8 Tonnes / Ha.
CER 11 had a height of 5.3m and canopy of 24.56m3, CER 13 @ 5.5m and 19.27m3 which is not very small either.
These results were achieved in the fifth year of planting, and caution should also be used as the trials were in Marlborough so might not apply to Central Otago.

Covering for Rain and Birds

Successful cherry production is all about managing risk. Two risk factors that can completely devastate a crop are birds and rain. It is for this reason that rain covers and bird netting are becoming standard items on a lot of cherry orchards as it can be the difference between staying viable and going broke.
One of the most spectacular failures was the corporate investment company of Cherrycorp. The syndicated company of Cherrycorp was set up in 1986, (first plantings), with 474 shareholding investors. After sustained crop losses, due mainly to rain splitting of fruit, the company was sold after going into receivership in April 1997. The company failure was due mainly to the inability to raise sufficient capital from investors to erect rain covers for the critical period 3 – 4 weeks pre-harvest. Cherrycorp's purchase of Apricotcorp was also causing a negative drain on operating cashflow. Of the 22Ha planted in cherries (the largest single planting in the southern hemisphere at the time), 14 Ha were planted in the Dawson variety which were prone to splitting after thunderstorms in the pre-christmas period. Essentially there was not enough varietal spread to cover the risk of rain splitting without the covers.

- The splitting of cherries is caused by a process called Osmosis. The dictionary defines Osmosis as," the passage of solvent molecules from a less concentrated to a more concentrated solution through a semi permeable membrane until both solutions are the same concentration". When it rains water ponds in the tiny cavity at the base of the stalk where it meets the cherry. This water is then drawn towards the sugary solution inside the cherry, through the skin, at which point the fruit will split if too much water is drawn in.

N.B.

While researching this project there was some debate that splitting could also be due to some degree to the excessive uptake of water through the roots, like a rush of blood to the head. I think the jury might still be out on this one but it is something that is due worthwhile consideration when managing your irrigation programme. Your soil moisture level should be at field capacity at the start of the growing season, and manage from here to avoid excessive swings in soil moisture levels.

You have several options in trying to deal with rain.

1. It was very common until recent times to use helicopters to come in and blow the water out of, or off the fruit, from a height of 5-10 metres above the tree once the rain had stopped. This method is relatively expensive and availability of helicopters can be an issue as they need to be in action quite soon after rain so all cherry growers want them at the same time. Orchard blowers are not as effective as they are blowing upwards at the wrong angle to get the water out of the cavity.

2. Calcium Chloride ($CaCl_2$) applied through overhead sprinklers is being used more commonly now to reduce the amount of fruit splitting from rain. Research done by Professor Jim Flore at Michigan State University and Greg Lang at Washington State University showed that diluted $CaCl_2$ does reduce the rain splitting of cherries. The $CaCl_2$ is applied through overhead sprinklers while it is raining and is thought to work by increasing the ion content of the water making it less pure. This in turn reduces the Osmotic pressure and subsequent rate at which water enters the cherry. Trials over 2 seasons in 1998 / 1999 in Central Otago showed a reduction of approx 18% in fruit splitting, although these trials did suffer from some mechanical failures that did affect results. Use of $CaCl_2$ in recent seasons over large areas of cherries is now seeing reductions of splitting of between 50% and 70%. It has also been suggested that the $CaCl_2$ also helps to strengthen the cell structure in the skin of the cherry, thereby also helping to reducing splitting.

3. Plastic rain covers are becoming more common now probably due to the high potential value of the crop and for peace of mind. These covers will typically cover 1 or 2 rows shedding the water into the alleys between the trees. The downside of these is their initial set up costs of $35K - $40K / Ha. These covers are easily damaged by wind so they will need to be pulled back from the trees after a rain event. Two people should be able to pull out, or fold back up the covers on 1 Ha in approx 1 hour. It has been suggested that with a good varietal spread that rain covers are probably not required if you are able to afford some losses due to splitting. It should also be mentioned that plastic covers can possibly create a higher humidity climate in the tree canopy causing soft fruit, so there are a number of issues to weigh up when deciding to use rain covers or going without.

Net covering of cherries for birds is now pretty much standard practise as yield losses can be staggeringly high without them, even if you are shooting or using bird scarers. Because of issues around the Resource Management Act with noise and safety in lifestyle block or built up areas, the use of shotguns is becoming less desirable. Some areas near Cromwell have been likened to a war zone with guns blazing and then helicopters flying in to dry crops as well. To net cover 1 Ha for birds will cost between $10K - $30K but you can lose that crop value in 1or 2 year to birds, so I think the economics of nets speak for itself.
In the case of dwarf cherries the economics of using nets and rain covers are even better, with the reduced size of mature trees requiring smaller structures.

Management

Dwarf

The aim of the research and development of dwarf cherries, by Professor Richard Rowe, was to produce trees and orchards that would require less overall management than traditional orchards.
There are 2 types of bags that have been developed specifically for root restriction. The first type is a synthetic fibre type bag very similar to shade cloth material. The second, recently developed and patented, is a plastic bag perforated with approx 40000 holes per bag with the holes being 0.2mm in diameter. Both bags are approx 20 litres in volume. Research has concluded that there is a ratio of root to canopy of 1:10 i.e. a 20 litre bag will produce a mature tree canopy at year 6-7 of 200 litres, (0.2m3 - think 44 gallon drum).

The main principles of root restriction are as follows.

- Roots take the path of least resistance and will not pass through a pore size, (or hole in a bag) that is smaller than its own diameter so will stop growing when it arrives at a pore size smaller than its current diameter. The roots do not continue to circle the bag becoming root bound, (as in you average garden shop pot or bag) but stop growing, thus affecting growth above the ground. What the tree roots do now is to grow laterals of a smaller diameter to the main root, and they will grow until they are affected by pore size, stopping and growing even smaller laterals. Eventually some roots will pass through the bag holes at 0.2mm in diameter but at this size the tree is unable to draw any nutrients or water through these roots due to the restrictive size of the roots, (like an irrigation pump trying to draw water through a straw). They take in nutrients and water via the holes in the bags. This is the principle of bonsai,"*where the growth rate of the tree is proportional to the volume of soil in which it is grown*". 45 years of research by Professor Richard Rowe has lead him to believe that the success of trees in bags is due in no part to biology but in fact physics, and the relationship between diameter and pressure.
- In the case of fibre bags it is suggested that the roots assume that the fibre is the competitive roots of another tree nearby and will not fight for more territory but share the space.

- For bags above the ground reliable and even water distribution is very important. This would have to be supplied via an irrigation system. This system allows for the complete coverage of the surrounding ground area, alleys between trees etc, which means complete weed suppression in the orchard i.e., no mowing or weed control. This system has the bags in "chutes" to help drainage for gently sloping sites or in the case of flat ground drainage holes are required through the ground covering plastic.

Both bags can be used either in the ground or above the ground, but soil type needs to be considered for bag type when in the ground as heavier wetter soils are probably more suited to plastic bags as they will restrict water uptake more than the fibre bags. In heavier wetter soils, or if over irrigated the tree will grow excessive woodstock and leaves.
Water restriction plays an important role in the management of the tree with an allocation of approx 1 litre of water / day / tree recommended as optimum, and after leaf drop 10 litres / month / tree.
Conventional thinking was that trees close their leaf stomata when they detect a water shortage or risk of a drought scenario. Stomata are pores in the leaf used for the transmission of gases into and out of plants. Professor Rowe however believes that the roots actually control whether the plant will go into a drought strategy or not, by detecting changes in the soil status, probably through hormonal means. Once into a drought strategy the fruit tree's priority is to reproduce, (seed) so needs an energy source which is CO2 via the stomata on the leaves, so the stomata need to be open. Traditional cherry trees have an approx ratio of 4 leaves to 1 cherry but dwarf cherries typically have a 1:1 ratio and have produced successfully at ratios of 1 leaf to 4 cherries.
Essentially what Professor Rowe has suggested is that if the invention of trickle irrigation took water use to a more efficient level then "*the use of root restricting bags should take the efficiency of water use to another level again".*

By producing a mature tree that is only 2 metres tall as opposed to 4-5 metres tall you significantly reduce the amount of labour required for pruning and harvesting, as well as the reduced cost of structures for bird proofing, rain and frost.

In the case of bags above the ground you have the option of maybe leasing land and then shifting or selling the trees at the end of the lease period. You could just specialize in growing out cherry trees and on selling mature trees. A "store" cherry tree market ??? This is happening now to some degree and could be in some way lead to a speculative market as demand to enter the dwarf cherry industry increases. Caution should be used when buying high priced 2-3 year old cherry trees as high prices based on "potential" returns remind me of the early days of the deer, goat, and ostrich industry where "potential" returns drove breeding stock prices to excessively high levels. Remember also the word "potential" is used all to often by those forked tongued real estate agents as well.

Another option with bags above ground that is in the experimental stage is to place the trees in chillers, removing them at a later stage in the season into glass houses and thereby producing later season, or out of season fruit when no one else

can supply the market. This has the potential, (there's that word again), for considerable premiums on the shoulders of the season for Southern Hemisphere fruit.
A good example of this is in the Sydney (Australia) market where cherries that are the first to market in the first week of November can attain considerable premiums. November 2002 saw 10 Kg of cherries sell for A$48000, yes $4800 / kg!

Traditional

From what I have seen researching this paper it is very easy to grow a cherry tree. Take a cutting off a tree, stick it in the ground and hey presto you have a tree. While maybe it is not that simple it would seem that for the novice orchardist they appear to be a fairly easy tree to grow to produce fruit. But to produce commercial quantities of marketable / export fruit requires a bit of skill.
The skill is in the micro management, the tweaking of all the growing parameters, the nutrient management, and managing the risk factors to produce that 26mm+ size export marketable fruit that the market will pay good money for.
A good starting point in Central Otago is The Cromwell Campus of the Otago Polytechnic which runs a very good starters guide to successful cherry growing.
In terms of the choice of varieties a good starting point would be to talk to some exporting packhouses and see what new varieties are coming on stream and what the overseas market is wanting in terms of size, flavour and colour.

Pest and Disease

Obviously to maintain high quality marketable export yields we need to manage pest and disease issues. Fortunately it would appear that cherries are relatively simple to manage as long as you have and follow a regular spray programme.

- Main pests are
    1. Black cherry aphid
    2. Leafroller moth – only limited
    3. Cherry slug - only limited

- Main diseases are
    1. Brown rot
    2. Bacterial canker / blast

Of all these the Black cherry aphid is the main problem. The eggs of the aphid winter over on the tree and these must be sprayed to choke the eggs in early to mid September
The cherry slug causes minimal damage to the cherry leaves affecting to a small degree photosynthesis.
Brown rot is not too much of a problem in Central Otago as it is only active in damp humid conditions.
Bacterial canker or Blast as it is commonly called can be a problem as it occurs in cool moist conditions such as occurs when you are using overhead sprinklers for frost fighting. This can be sprayed with Nordox at a ratio of 1:3 with water.
Blast can be pruned out in December when the disease is dormant or in bad cases complete tree removal is recommended.

See the table at rear for a suggested spray programme. You should note that most of the sprays listed are in fact folia fertilisers, and all of the sprays are also export safe.
To be an export seller you also need to hold a Growsafe certification, which is required for the Summergreen export programme.
Summergreen is an industry based Integrated Pest Management, (IPM) regime that aims to ensure spaying is minimized and is based on monitoring - justifiable spraying. The IPM also deals with issues such as sustainable production, soil improvement, tree management etc, and export to many countries now requires you to be part of an IPM programme. Integrated Fruit Production (IFP) is the use of sustainable and environmentally responsible fruit production techniques on the orchard without compromising fruit quality, yield and overall financial performance and this is an integral part of the Summergreen programme also. These certification programmes are run under the auspices of Summerfruit NZ as part of the Export Marketing Strategy. See export for more details.

Frost

The critical time where cherry flowers will become damaged by frost begins at bud swelling which in Central Otago is mid September. Cherries will tolerate some frosting at the flowering stage but the effects of frosting from the small green fruit stage on can be quite devastating, and after petal fall you could lose the entire crop, so frost control will become very important from early October onwards.

The critical temperatures and their effects at various development stages are as per the chart below.

1. The old standard is the lowest temperature that can be endured for 30 minutes without bud damage.
2. Temperature at which 10% and 90% of buds will be killed
3. Data collected by researchers at Washington State University Prosser Research Centre and adjusted for Central Otago Flowering dates and to oC.

Bud Development Stage**	1	2	3	4	5	6	7	8	9
Old Standard Temp.[1]	-5	-5	-3.9	-2.2	-2.2	-1.7	-1.7	-1.7	-1.1
Ave. Temp for 10% Kill[2]	-8.3	-5.5	-3.9	-3.3	-2.8	-2.8	-2.2	-2.2	-2.2
Ave. Temp for 90% Kill[2]	-15	-12.7	-10	-8.3	-6.1	-4.4	-3.9	-3.9	-3.9
Average Date (Prosser)[3]	5-Sep	Sep-13	Sep-23	Sep-27	1-Oct	4-Oct	8-Oct	Oct-13	Oct-21

1- First swelling, 2- side green, 3 – green tip, 4 – tight cluster, 5 – open cluster, 6- first white, 7 – first bloom, 8 – full bloom, 9 – post bloom.

Otago Polytechnic Cromwell Campus
Successful Cherry Growing

- The Grow Otago project has determined that for 4 out of 5 years the last frost will occur between 28th October and 6th November in the Teviot Valley. NIWA frost recording data at Ettrick, (approx 5 km south of the author's property) has a total of 8 frost readings for September and October 2002, the last one on Oct 14th, ranging from 0 to -3 degrees. This would suggest that some frost protection would be required.

Various methods could be used for frost protection as for most fruits.

1. Diesel burning frost pots at 50/ Ha @ approx $150 ea. These need an inversion layer to trap the heat and burn 10+ litres of diesel / night.
2. Wind machines that use an inversion of warm air and circulate it back down through the crop. One machine per 4-6 Ha @ approx $55K for a new 4 blader. Will protect to -2 to-3 degree and are limited in advection type frosts which are rare, but is what occurred in 2002.
3. Water from overhead sprinklers will protect to -8oC but needs to be applied continuously and can have negative impacts on the soil and can spread bacterial blast. Costs approx $7K-$10K / Ha for mainlines and pipe work. Sprinklers should only be turned off when ice is falling off or melting away from the fruit.

Production

Yield

Traditional

There is no typical cherry orchard in New Zealand as areas planted vary from orchard to orchard, the smallest from 0.25 Ha up to 50 Ha on some of the larger orchards.
It is estimated that probably 80% of the cherry production is achieved by 20% of the actual growers. I would also suggest that there are a lot of small orchards, up to maybe 5Ha and a few very large producers in the 30Ha -50Ha range with not a lot in between.
Given the range of areas planted, the management techniques, and the diverse range of microclimates between orchards there will obviously be a wide range of crop yields between orchards.

The number of cherry trees per Ha has also varied considerably over the last 20 years as growers have tried to maximize returns with various planting regimes being employed over that time.

20 years ago 340 trees per Ha was the norm. Plantings of 1000 trees / Ha are now fairly standard with newer plantings but the range of tree densities is 700 – 1000 / Ha.
1000 / Ha =5 metre rows with trees at 2 metre centres
At the heavier planting rates issues of light interception, consequently fruit ripening becomes an issue so it is important to get your tree pruning and training correct for maximum light interception. Successful growing of any summerfruit is essentially all about harvesting sunlight.
Trees 20 years ago were pruned to the "vase" shape. The accepted method of tree training and pruning now is the "pyramid" shape creating the "sawtooth" effect along rows giving maximum light interception.

Cherry trees come into maximum yield at 6-7 years of age.
Typically the per Ha yield at tree full maturity will be in the range of 10 – 16 Tonnes per Ha. For budgeting purposes 12 Tonnes per Ha is the recommended average volume.
For budget purposes also you should expect to have a complete crop failure 1 out of every 5 years, and for 2 out of 5 years to expect 20% crop damage due to either pest, disease, frost, rain or poor fruit set due to a cold spring.

Aside from the issues of pests, rain and disease the main driver of ultimate yield will be determined by the amount of pollination at fruit set.
Use the table below only as a guide, very dependant on variety/management/weather.

- Age 1 2 3 4 5 6
  Kg/tree 0 0 2 5 10 15

Dwarf

As dwarf cherries have only been planted on a larger commercial scale in the last 5 years information on yields can only be extrapolated out from what is known to date. Present yield data has 2 year old dwarf trees yielding up to 4 kg / tree but a realistic average for budgeting purposes has suggested that 0.5 kg / tree should be used at this age.
4 year old trees have yielded up to 10 kg / tree, but 4 kg / tree is an acceptable conservative average at 5-7 years old, (full maturity)
At plantings of 5000 trees / hectare this would give an annual yield for 2 year olds @ 2 tonnes / Ha and 20 tonnes / hectare at 5 - 7 years of age.
5000 / Ha has rows @ 2m centres and trees @ 1m centres.

Labour and harvest

Labour to harvest cherries will be in the vicinity of $1 - $1.25 / Kg i,e, usually a contract rate. All cherries are hand picked. An average picker will pick between 100 – 150Kg / day. So if you do your sums based on 12 Tonnes / Ha you will need 12 staff for 10 days / Ha, (120 picker days). Varietal spread becomes important at this stage as it maybe a problem sourcing staff for a very short harvest window of a few varieties. You will also need more equipment, (hydralada etc) which could be in short supply at the time. The last few harvest seasons in Central Otago have seen a chronic staff shortage for all fruits. It is estimated that in the greater Central Otago Lakes district for the 2003 / 2004 summerfruit season there will be a staff shortage of approx 3000 people.
Some machine picking of cherries has been trialed overseas but it tends to remove the stem which is not very good for market presentation and could allow for disease penetration at the point of stem removal, thus reducing shelf life.
Once cherries are picked it is critical to chill or cool them (to approx 2oC-4oC) to remove the latent field heat they are holding which will be around 15oC. For every hour delay in chilling after picking, it is approx 1 day less shelf life.

Processing

Export

The Export Marketing Strategy, (EMS) is the document that specifies and sets out the conditions and responsibilities the summerfruit industry must abide by under the Horticulture Export Authority (HEA). This is the formal structure that licenses exporters, growers and their pack houses, for the export of cherries and other fruits. The EMS is updated annually by Summerfruit NZ and all growers who are exporting must have a copy of this document and it is their responsibility to understand these guidelines.
The HEA also sets the grading standards and quality control systems for growers and pack houses, which are then audited by Agriquality.
There is also an annual registration fee of $142.50 + GST, (2003) for all growers, packhouses and exporters payable to SNZ. For licensed exporters intending to export in anyone season they must register and pay an annual fee of $1500+GST to SNZ.
There are only a handful of packhouses that export in NZ. Most cherries are shipped through exporters who are multi product exporters.
Export registered growers will receive an annually updated list of maximum residual levels (MRL's) that are allowable for each market and SNZ conducts a programme of random residue testing throughout the harvest season to monitor levels.
There is also a Summerfruit Commodity Levy Order in place which is deducted from all summerfruit at the first point of sale, and this helps to fund SNZ.
The levy rate is;

- Apricots, nectarines, peaches & plums 1.5%
- Cherries 0.75%

The cherry export industry in New Zealand is very fragmented with no single desk seller of cherries and very little co-ordination of marketing between growers.
Best estimates have approx 50% of the NZ cherry crop produced by corporates, i.e. companies, equity partnerships, with the balance made up of very small hobby or part timers to bigger family owned orchards.
The main reason given for the fragmented status of the industry is the very short shelf life of the cherry itself. Given the perishable nature of cherries, the period from harvest to the retail outlet overseas must be less than 4 weeks, unlike the kiwifruit that has an approx shelf life of 6 months +. It would seem that having an industry body or producer board handling, packing and shipping hasn't evolved as individual growers have their own supply routes and customer base, with timing of supply being critical for quality fruit that ultimately maximizes returns.
See tables at rear for export related data.

Grading and packing

Packing and grading will be approx $1.50 / Kg if done through a licensed pack house for export.
Freight will be another $0.30 / Kg for sea freight and $2 - $3 / Kg to airfreight.

Below is the Summerfruit NZ industry grading standards for cherries for 2002 / 2003.

Cleanliness:	Free from dirt, dust insect stains or other foreign substances.
Shape:	Typical of variety. Slight variation permitted.
Colour:	Typical of variety when mature.
Maturity:	Even. Able to withstand transportation and complete the ripening process.
Sizing:	Recommended size banding: Export minimum 22 mm <22 mm, 22-24 mm, 24-26 mm, 26-28 mm, 28-30 mm, 30 mm +
Tolerance:	10% tolerance level for cosmetic defects. 10% tolerance level for size.

	TAG 1	**TAG 2***
Stems:		
Bing/Summit/Lambert varieties	May be stemless	May be stemless
Other varieties	Intact	Intact
Blemish/Russet	With 0.25 sq cm	With 0.5 sq cm
Cracks, cuts, punctures:		
Healed & dry	Shallow, Dry <5mm	Dry healed
Unhealed or damp	<2%	<2%
Bruising	Nil	<10% of line with 0.25 sq cm
Pulled Stems	Nil	Allowed
Sun scorch, wilt & shrivel	Nil	Nil
Maturity	Fruit firm. Even Colour	Fruit firm. Even Colour
	Minimum 15 Brix	Minimum 15 Brix

Revenue and costs

Revenue

From a traditional cherry orchard you would normally expect to produce 70-75% of the fruit as export quality, (range of 60%- 90%). Export fruit is mainly graded by size but of course is also determined by blemish, colour, firmness and brix levels. Fruit above 30mm diameter will fetch in the order of $16-$18 per Kg, BUT you should only expect 20% of your export fruit, (i.e. 1/5 of 70-75% of the total yield) to fall in to the 30+mm grade. From a 12 Tonne per Ha yield this is 1750 Kg Revenue will fall to $5 - $6 / Kg for fruit down to 24mm, which inevitably will end up on the domestic market at grocery stores or road side stalls.

Across all grades a good average to use for budgeting is approx $10 / Kg for total yield. It has been suggested that with the increase in cherry plantings that the long term average $/ Kg may reduce to $7.00 - $9.00.

Prices are determined by negotiation prior to export, and are set on a willing seller willing buyer basis with this prior to export price sometimes changing when the fruit arrives at its destination, again due to the perishable nature of the product.
As mentioned size, blemish and colour are the main price determining factors but brix or sugar levels, which obviously determine sweetness are also a factor. Green stems which must be attached to the fruit are also important and fruit deformity is also an issue.
Of course above all else market demand is the main driver of price and as New Zealand is competing with other Southern Hemisphere countries, (especially Chile) timing of supply is a very important factor in determining returns. Growers in Central Otago try to have fruit on the export market at a time when there is diminishing supply from other cherry growing countries. It is for this reason that later or earlier ripening varieties are being used to meet customer demand on the shoulders of the normal supply and demand curve.

Dwarf

As there has been no export of cherries from dwarf trees as at 2003 it is hard to compare revenues.
The past season, (summer 02/03) saw all of the dwarf crop sold through domestic supermarkets or road side stalls for around the $10-$15 / kg mark. Again there are no accurate figures of actual % of total yield that was marketable. Best estimates have the marketable yield at 70%, and most of the marketable fruit was said to be in the 30mm+ category so this would bode well for exporting returns.
There has been no export to date of dwarf grown cherries and it is unlikely for the 2003 / 2004 summer season. Plans are under way to establish a growers co-operative based around the Oamaru cluster of growers and they are hoping to be exporting for the 2004 / 2005 season. Given the number of trees planted it is probably imperative to have some export capability by then to gain some price premiums as excessive fruit on the domestic market will surely suppress the $ return.

Costs

The cost of producing cherries varies quite significantly which is understandable given the range of microclimates and the different management techniques employed between orchards.

I have compiled the chart below from actual financial results as part of the Central Otago Focus Orchard programme.

The information is a comparison of 3 separate properties producing 2 varieties of cherry, Bing and Lapin, during the 2002 season. Trees from all 3 properties were planted at 833 trees / hectare.

	Range	% / Gross	Mean % Gross
Revenue $ / tree	90 - 132		
Gross $000 / Ha	60 -110		
Expenses $000 / Ha	28 - 46	42% - 57%	49%
Surplus $000/ Ha	30 - 64	43% - 58%	51%
Pre harvest costs			
Mowing / pruning	0.8% - 1.3%		
Bird control	2.8% - 3.5%		
Fert / Spraying	5% - 11.6%		
		8.6% - 16.4%	12.50%
Post harvest costs			
Picking	9.7% - 16.4%		
Packing	14.4% - 21.6%		
Hydralada	2.0% - 4.5%		
Freight	1.5% - 3.0%		
Drying	1.0% - 2.6%		
		28.6% - 48.1%	38.35%

MAF Sustainable Farming Fund (Financial Summaries)
Focus Orchard Field day August 2002
Calculations above collated by Author.

From the above data we can see that there is a wide range for both revenue and expenses. Once we have broken this data down into pre and post harvest we can see that the pre harvest costs are relatively small, with fertilizer and spraying the largest pre harvest cost. The suggestion here would be if you had a total or large crop failure in any one season then there are not a large proportion of your direct costs wasted as the big % are mainly harvest / post harvest.

Looking at post harvest costs we can see a fairly tight range of costs for hydralada, freight and drying with a relatively large range for picking / packing.

I would have presumed that the picking and packing costs would be fairly static in percentage terms relative to the per hectare yield, with the actual dollar cost varying depending on yield e.g. more crop to pick, more labour required. But the large range

in % terms is probably more of a reflection of the fruit grade for a given season and the $ per kg that is achievable due to grading and consequently marketable yield.

The point here is that 26% - 43% of the direct costs are taken up with picking, hydralada and packing, and could be an area of considerable cost savings under a dwarf orchard system where there is potential for less labour, no hydralada required, and possibly better grading as the fruit can be manipulated easier. Obviously with dwarf cherries under cover there is no bird control required, no mowing or weed control in the case of cherries in bags above the ground, and there also seems to be far less fertiliser and spraying for disease also.

The accumulated cash flow below has been produced based on what information on yields is available at the present time for dwarf cherries, and caution should be used if using this for budgeting purposes.
We can see that payback occurs at year 4 with this scenario. Information from the Central Otago Focus Farm based on actual data has traditional cherry orchards achieving payback in year 5, (see additional comparisons with other fruit below).
We can also see that by year 7 the $ production costs / hectare are at the lower end of the range for traditional orchards, ($28K - $48K) but in % of gross terms they are far less at 13%. This is assuming you can yield 20 tonnes @ $10 kg ave.

Cash flow model

Dwarf cherry tentative cost and returns
Based on 5000 trees / hectare @ $10.00kg

	Yields/Ha	Costs	Revenue	Accumulated cash flow
Year 1	Set up	67870	0	-67870
Year 2	2 tonnes	8250	20000	-56120
Year 3	4 tonnes	9270	40000	-25390
Year 4	7 tonnes	12360	70000	32250
Year 5	20 tonnes	18560	200000	213690
Year 6	Crop failure	22480	0	191210
Year 7	20 tonnes	26560	200000	364650

Field Horticulture 2003

Comparisons

The comparison chart below was produced as part of the Focus Orchard Field day to compare the profitability of summer fruit and grape production systems in Central Otago as they are both suited to similar land types and both to some degree compete for investor dollars. Although it must be said that grapes are by far the flavour of the moment for investors in Central Otago due to their more romantic and sexy appeal. The comparisons used partial budgets based on real orchard and vineyard businesses and were extrapolated out over a 10 year period and are based on establishing a 1 hectare block across all fruit types.

- The establishment included site preparation, irrigation systems, trellis systems, plant establishment and pre plant fertilizer. In the case of cherries and grapes it doesn't include the cost of fully covering the crop for birds or rain.

- Production inputs included fertiliser, pest and disease control, weed and mowing, bird control, and labour for pruning, training etc.
- Harvesting costs are all by hand.
- The capital requirement for plant and equipment is similar, (tractors, sprayer etc)
- The Internal Rate of Return (IRR) is the average rate of return on the investment. The IRR can be thought of as the equivalent compound interest rate the investment earns, if all the returns were reinvested and received as a lump sum at the end of the investment period. In this case 10 years.
- The Net Present Value is the sum of the 10 year series of cash flows. It is the net cash surplus obtained from the project, assuming you borrowed all the set up capital for establishment costs, and after paying the interest.
- In this case an interest rate of 10% has been used.

Caution should also be used when interpreting these figures as neither the cherries or grapes have allowed for any covering for birds, but if they did their respective comparisons would probably still be similar

	Est Costs (yr1-3)	PPY	IRR	NPV
Cherries	$28,568	Yr 5	28.65%	$136,174
Wine & Grapes	$34,301	Yr 5	27.07%	$136,345
Grapes	$34,301	Yr 7	1.51%	$3,930
Apricots	$14,390	Yr 6	18.97%	$38,467

PPY - Pay-back period
IRR - Internal rate of return
NPV- Net Present Value

Alastair King, Senior Advisor.
Cook Adam & Co Chartered Accountants, Wanaka.
Profitable land use in Central Otago, August 2002

Note the large difference between grapes / grapes and wine is due to the added value if you are bottling and selling under your own label as opposed to commodity trading bulk grapes for processing.
Maybe plant some apricots to spread your risk??...Still a good return!

Export data

NZ Cherry exports by destination

By kg Volume

		2002/2003	2002/2001	2000/2001
Australia	1.2%	8140	9372	0
Japan	0.8%	5300	3379	14302
Nth America	0.3%	2000	0	660
Taiwan	**85%**	604477	405808	535713
Hong Kong		0	0	0
Singapore	1.9%	13397	25294	17534
Korea	3.9%	27630	17395	20428
Pacific	0.1%	623	2353	4323
Others*	7.0%	49938	39666	19377
Total		711505	503267	612337

*includes Europe

Summerfruit NZ 2003

NZ Summerfruit Total export by value

Value (NZ $ FOB($000))

	1990	1997	1998	1999	2000	2001	2002	2003	total % +/-
Cherries	1835	3150	7809	5400	5569	7701	7349	8323	**353%**
Apricots	1804	3884	1692	3969	8069	6785	10489	5884	**226%**
Nectarines	5350	2823	*	1391	695	293	530	206	**-96.10%**
Peaches	342	428	*	137	319	154	29	42	**-87.70%**
Plums	189	37	43	131	95	184	269	105	**-44.40%**
Total	9520	10322	9544	11028	14747	15090	18666	14560	
Cherry %	**19**	**31**	**??**	**49**	**38**	**51**	**40**	**57**	

*figures unavailable

Summerfruit NZ 2003

% +/- By Author

NZ Summerfruit export by volume

Tonne

	1990	1997	1998	1999	2000	2001	2002	2003	% +/-
Cherries	198	349	643	469	445	612	503	712	**259%**
Apricots	543	1085	639	1408	2019	1362	1783	1196	120%
Nectarines	1679	1098	855	726	595	249	176	45	-97.00%
Peaches	322	157	121	134	173	66	9	5	-98.00%
Plums	0	8	12	27.5	53	34	56	9	900%

Total	2742	2697	2270	2756	3285	2323	2527	1967

Cherry %	**7**	**13**	**28**	**17**	**14**	**26**	**20**	**36**

Average price (NZ $ / FOB ($KG))

	1990	1997	1998	1999	2000	2001	2002	2003	%+/-
Cherries	7.78	9.03	12.14	11.51	12.51	12.58	14.61	11.69	**50.00%**
Apricots	3.01	3.58	2.65	2.82	4	4.96	5.88	4.92	63%
Nectarine	2.16	2.57	*	1.92	1.17	1.18	3.01	4.58	112%
Peaches	2.61	2.72	*	1.02	1.84	2.33	3.22	8.4	268%
Plums	3.32	4.66	3.58	4.76	1.79	5.41	4.8	11.67	251%

*figures unavailable
Summerfruit NZ 2003
% +/- By Author

An interesting fact that arises from looking at these charts is that if there was 712 Tonnes of cherries exported in 2003 from an orchard area in NZ of approx 550 Hectares, then only 1.3 Tonne / Hectare on average is actually exported!
Where did the rest go??????
Also while the actual volume of cherries exported has increased by 259% from 1990 - 2003, the value has increased at a much slower rate, (50%) compared to other summer fruits, albeit with reducing volumes of Nectarines and Peaches, and much lower $ starting points.
Which raises another point, has a reduced volume of supply for Nectarines, Peaches and Plums helped to raise the $ returns??

Conclusions

At various stages while putting this document together I have run hot and cold on the idea of establishing a cherry orchard as part of the overall farm operation. Do I need the extra worry of unseasonable weather vagaries such as out of season frosts or unseasonable snow such as what has occurred this October (2003) and has damaged a lot of the early summerfruit in Roxburgh area.

When looking at the financial returns that are achievable it would seem to be a great cash flow diversification albeit for a couple of months, (Jan / Feb) but at the cost of a high stress level and workload at a time of year, (Christmas, New Year) when most sheep and beef farmers are thinking of getting some r and r with the boat. Although if you can handle the harvest labour spike then labour wise the rest of the year is fairly easy.

While researching this document I also asked a local banker if many sheep and beef farmers have diversified into horticulture in the Central Otago area. To which he responded "*no, for the same reason why orchardists don't diversify into sheep and beef as part of their operation".* It is a question of what tickles your fancy.

Successful cherry growing is all about managing the risks involved, the major ones being frost, labour, birds and rain as well as tweaking that micro management of the trees to extract high marketable yields.
They seem to be a good option for the Central Otago climate and soil, have seemingly good world markets, but given the size of the NZ crop we are really only a drop in the ocean in terms of our marketing strength so we need to rely on the well worn clean green image to see us through, which is to some degree what is happening.

Cherries are relatively costly to establish compared to other summerfruit but have higher long term returns and similar payback periods if managed correctly.
Grapes and wine can be compared as competing for investor dollars and land. But considering the amount of grapes that have been planted in the Central Otago region recently, and wondering who is going to drink all the increased production of wine, I think I would opt for the not so sexy cherry option.

Considering the recent developments of dwarfing cherries in bags with similar establishment costs (depending on frost and bird requirements), less labour requirements, higher per hectare yields and easier overall management you would have to say that they would seem to be a very attractive alternative to the traditional orchard , especially if land area was an issue.

Dwarf cherries are not without some issues though as a dwarf cherry once harvested looks like any other cherry and must compete for the customer dollar on its merits. Given that size is everything in the export market I don't think you will see them marketed as "dwarf cherries". So the Oamaru cluster of dwarf growers will need have its act together to compete with the big boys out there doing the business already, when their increasing production starts to hit the export market.
In concluding I have not decided whether we will plant some cherry trees yet,…...the neighbours farm is up for sale soon.???!!!!

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A guide to your spray programme for cherries
N.B Most of these are actually folia fertilizers

Date	Product	Use
20/08/2002	Lime	pH of spray
	OLEO 40	fungicide/bactericide
	Zinc Sulphate	fertiliser - zinc
5/09/2002	Mobil DCTRON oil	black cherry aphid eggs and young scale
	OLEO 40	fungicide/bactericide
	Pirimor 50	black cherry aphid
25/09/2002	Carbendazim	fungicide
	Solubor	fertiliser -boron
8/10/2002	Folicur 25DF	fungicide
	Solubor	fertiliser -boron
11/10/2002	Amino N	Fertilise - nitrogen
19/12/2002	Panda	fertiliser - calcium
	Rovral	fungicide
13/03/2003	Lime	pH of spray
	Magnesium Sulphat	fertiliser - magnesium
	Nordox	fungicide - copper
	Solubor	fertiliser -boron
	Zinc Sulphate	fertiliser - zinc
4/04/2003	Lime	pH of spray
	Magnesium Sulphat	fertiliser - magnesium
	Nordox	fungicide - copper
	Solubor	fertiliser -boron
	Zinc Sulphate	fertiliser - zinc
23/04/2003	Lime	pH of spray

Cashflow - Cherries 1 ha

Expenditure	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Capital Expenditure										
Tree purchase	10000					2000				
Tractor and mower	6500									
wind machine			55000							
nets				30000						
Operating Expenditure										
Consumables	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Ground Preparation	500									
Planting	500					200				
Mowing	250	250	250	250	250	250	250	250	250	250
Pruning		1000	1500	2500	3000	3000	3000	3000	3000	3000
Training		2000					500			
Soil testing	185	185	185	200	200	200	200	200	200	200
Machinery maintenance			500	500	500	500	500	500	500	500
Pre season Maintenance		200	200	200	200	200	200	200	200	200
Irrigation Maintenance		200	500	500	500	500	500	500	500	500
Pollination				200	200	200	200	200	200	200
Crop inspection/monitoring		200	500	500	500	500	500	500	500	500
Frost protection			1000	1000	1000	1000	1000	1000	1000	1000
Crop Spraying	1500	2500	2500	2500	3000	3000	3000	3000	3000	3000
Weed Spraying	300	500	500	500	500	500	500	500	500	500
Bird control			2500							
Fertilising	500	1000	1500	2500	2500	2500	2500	2500	2500	2500
Retailing			500	1000	1500	1500	1500	1500	1500	1500
Summer pruning			500	1000	1000	1000	1000	1000	1000	1000
Leaf testing		100	100	100	100	100	100	100	100	100
Harvesting			2000	5000	10000	15000	15000	15000	15000	15000
Mulching			500	500	500	500	500	500	500	500
Packing and selling			4000	10000	20000	30000	30000	30000	30000	30000
Overheads	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Total Expenditure	22735	10635	76735	61450	47950	65150	63450	62950	62950	62950
Income			20000	50000	100000	150000	150000	150000	150000	150000
Nett Income before tax	-22735	-10635	-56735	-11450	52050	84850	86550	87050	87050	87050
Cumlative balance	-22735	-33370	-90105	-101555	-49505	35345	121895	208945	295995	383045

Key Production Dates - Cherries 1 ha

Task	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ground Preparation						8	8	8				
Planting								6				
Mowing	2	2	2	2					2	2	2	2
Pruning						32	32					
Training												
Soil testing						1						
Machinery maintenance	2	2	2							2	2	2
Pre season Maintenance								8	8			
Irrigation	8	8	8							8	8	8
Pollination								4				
Crop inspection	8								2	2	2	2
Frost protection										20		
Thinning												
Crop Spraying	4	4	4	4	4			4	4	4	4	4
Weed Spraying		4							4		4	
Bird control	100											200
Fertilising	4		4						4		4	
Fertigation												
Retailing	8											
Summer pruning												20
Leaf testing												1
Harvesting	1200											400
Mulching							4					
Administration	10	2	2	2	2	2	2	2	2	2	4	4
Total Hours/month	1346	22	22	8	6	43	46	32	26	40	30	643
Days available/month	23	20	21	22	22	21	23	21	22	23	20	23
Hours available/month	184	160	168	176	176	168	184	168	176	184	160	184
Labour units required	**7.31521739**	**0.1375**	**0.130952**	**0.045455**	**0.034091**	**0.255952**	**0.25**	**0.190476**	**0.147727**	**0.217391**	**0.1875**	**3.494565**

Effect of cherry rootstocks on the growth and yield of Stella cherries – 1995 Data

Year Planted	Rootstock	Average Growth Ext. (cm)	Average Butt Circ (cm)	Average Tree Diameter (m)	Average Canopy Area (m^2)	Average Internode Distance (cm)	Height (m)	Canopy Volume (m^3)	Average Yield 1994 (g)	Yield Eff 1 1994 (kg/m^3)	Butt Xsec Area (cm^2)	Yield Eff.2 1994 (g/cm^2)
1989	CAB 4D	64.50	53.00	3.75	11.04	2.71	5.15	18.96	12047.1	635.5	223.5	53.9
1989	CER 10	57.93	53.20	3.83	11.52	2.49	4.85	18.63	23424.9	1257.4	225.2	104.0
1989	CER 11	47.07	45.83	4.18	13.87	3.04	5.32	24.58 *	33298	*1354.7	167.2	199.2 *
1989	CER 13	52.73	49.50	3.60	10.42	2.94	5.55	19.27 *	28961.4	*1503.0	195.0	148.5 *
1989	COLT	54.23	59.43	3.81	11.43	3.19	5.63	21.43	10463.2	488.2	281.0	37.2
1989	GM 61	55.48	39.30	2.48	5.07	2.51	4.58	7.73	1237	160.1	122.9	10.1
1989	GM 79	46.33	39.63	2.75	6.07	2.85	4.30	8.70 *	13813.6	*1588.1	125.0	110.6 *
1989	MAHALEB	55.30	38.68	2.34	4.34	1.56	4.71	6.82	3884.7	569.3	119.0	32.6

Canopy Volume	=	1/3 Base Area * Height (m^3)
Yield Efficiency 1	=	Yield/Canopy Volume (kg/m^3)
Yield Efficiency 2	=	Yield/Butt XSec Area (g/cm^2)

Yield Per Hectare (based on the small number of trees in the trial)

GM 79 at 952 trees /ha = 13.15 tonnes/ha from 13813 g/tree

CER 11 at 493 trees /ha = 16.4 tonnes/ha from 33298 g/tree
CER 13 at 493 trees /ha = 14.3 tonnes/ha from 28961 g/tree

* Refered to in report

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