



SID 5 Research Project Final Report

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Executive Summary

7. The executive summary must not exceed 2 sides in total of A4 and should be understandable to the intelligent non-scientist. It should cover the main objectives, methods and findings of the research, together with any other significant events and options for new work.

Of all the organic food sectors in the UK, top fruit is one of the least developed. Despite strong consumer demand and high prices for organic fruit there are, at present, only a handful of commercial organic dessert apple and pear growers. One of the barriers to conventional growers converting to organic production has been the lack of robust data on the economics of organic fruit growing. Therefore the overall aim of this study and benefit to the sector was the collection and assessment of economic data from commercial organic top fruit (dessert apples and pears) farms for three seasons (2001-2003) in order to determine its economic feasibility. Data was collected from fruit growers and processed according to Farm Business Survey techniques and was also analysed on a pence per kg basis, a full cost accounting technique developed for analysing top fruit crops.

Over the past few years there has been a rapid growth of both the market for organic top fruit, and an increase in the area of land converted to organic top fruit production, although much of the latter has been of older cider orchards. The market for organic top fruit, with a retail value of £67 million and 7% share, is one of the largest organic product groups in the organic market. In 2003, 1187 hectares of organic top fruit were grown, with an estimated retail value of £6.7 million. UK-produced organic top fruit supplies 10% of the market, with the remainder being imported, compared with 21% in the conventional sector. Although growers had previously been reluctant to convert to organic production due to the high costs of conversion, a small number responded in the late 1990's to the higher prices achievable, supermarket pressure, and to the increasing level of government subsidies available.

The on-farm economics of organic apples and pears was largely determined by the level of yields of fruit for the fresh market, prices and costs of production. The greatest variation in income from individual orchards, varieties, farms, and years was caused by differences in the total yield and the proportion of the yield, known as 'gradeout' in the fruit industry, which reached Class I & II (this was typically 50-65% for apples and 50-85% for pears). Prices were relatively stable.

Yield variations were caused by the UK climate, with its variable spring and summer weather pattern, the weather also indirectly affected yields through its influence on pest and disease levels, especially in 2002. Organic apple yields were found to be 50-80%, and pears 25-55% of those in conventionally managed orchards. Many of the surveyed orchards contained a large proportion of varieties such as Cox, which are less suitable for organic production systems. Only 20% of the varieties in the survey farms had been specifically planted for organic purposes.

Where fruit was processed into juice and bottled on the farm, this proved a very valuable way of

maintaining total farm income. Across the various farms costs were fairly similar. The largest proportion of costs, were for marketing (30%) and overhead costs (44% -other labour, machinery, rent, orchard depreciation and general fixed costs). Top fruit growing is very labour intensive and labour accounted for 30% of on-farm costs. Total organic costs per hectare were similar to conventional ones.

Average net margins for apples (£455/ha, 5p/kg) gave a 7% margin over costs, and pears (£315/ha, 5p/kg) 5% for the years 2001-2003. A 15% rate would have been regarded as very profitable. At a gross margin level the organic crops were higher than conventional equivalents. With average current prices and costs a breakeven point can be achieved at 7t/ha for apples and 5t/ha for pears. However, the averages fail to show the large range of results that occurred, and that during the survey period nine apple and pear crops (a crop includes all varieties on an individual farm), which represented 43% of the crops grown, made a loss.

As costs were fairly similar, the variation in net margin was directly related to the variability in yields. Some farms did notably better than others and this is in part due to their more favourable sites for fruit growing e.g. better soils. It is of some concern that profitability is currently highly dependent on high prices for organic fruit (typically double that of conventional fruit), which may fall as UK supplies increase. A 20% reduction in prices for apples would lead to a halving of net margin and a 45% reduction would lead to all farms making a loss.

Although demand for organic dessert fruit continues to grow, the rate of conversion of UK organic dessert top fruit growers to production is still relatively slow. The main constraints continue to be: the high costs of conversion to organic production, estimated to be £6,800/ha for the conversion of an existing orchard over a three-year period, with the cost of establishing a new orchard being greater than £10,000/ha; and the low level and inconsistency of yields and thus profitable returns. To ensure continued investment in new plantings and to allow for management income and profits, average yields need to be increased. It is thought that even with the increased rate of Organic Farming Scheme Payment, of £1860/ha over five years introduced in 2002, will not provide sufficient economic incentive for farmers to convert more land.

The crux is that growers are still hampered by low and variable yields due to lack of suitable varieties and the inability to control pests and diseases, which have a major impact on the economics of production. A DEFRA Horticultural LINK project 'Varieties and Pest and Disease Management for Organic Apple Production, has been addressing some of these issues, although much still remains to be done. The number of growers converting and investment by existing growers in new orchards with more appropriate varieties remains limited.

If UK produced organic top fruit, currently meeting 10% of the market, is to rise to comparable levels of self-sufficiency in the conventional sector (21%), then an additional 1,000 hectares (at current yields) would need to be converted. Since it is the Organic Action Plan objective to see more UK grown organic top fruit, then government and business support for this fledgling sector should continue, and be co-ordinated. It is recommended that support can be provided through further funding for research (e.g. varieties, nutrition, pests and diseases, weeds, market, economics), development and dissemination of existing research.

Project Report to Defra

8. As a guide this report should be no longer than 20 sides of A4. This report is to provide Defra with details of the outputs of the research project for internal purposes; to meet the terms of the contract; and to allow Defra to publish details of the outputs to meet Environmental Information Regulation or Freedom of Information obligations. This short report to Defra does not preclude contractors from also seeking to publish a full, formal scientific report/paper in an appropriate scientific or other journal/publication. Indeed, Defra actively encourages such publications as part of the contract terms. The report to Defra should include:
- the scientific objectives as set out in the contract;
 - the extent to which the objectives set out in the contract have been met;
 - details of methods used and the results obtained, including statistical analysis (if appropriate);
 - a discussion of the results and their reliability;
 - the main implications of the findings;
 - possible future work; and

- any action resulting from the research (e.g. IP, Knowledge Transfer).

Introduction and background

Of all the organic food sectors in the UK, top fruit production is one of the least developed. Despite strong consumer demand and high prices for organic fruit there are, at present, only a handful of commercial organic dessert apple and pear growers. One of the barriers to conventional growers converting to organic production was the lack of published data on the economics of organic fruit growing. Without this information, conventional growers were unable to assess whether it was economically feasible to convert to organic production.

Aims and objectives

The overall aim of this study was to collect and assess economic data from commercial organic top fruit farms for three seasons (2001-2003). Each year this involved:

- Collection of whole farm data according to Farm Business Survey standards from a sample of five top fruit farms for each year.
- Calculation of gross and net margins and expressing returns and costs per kilogramme of fruit produced from both organic apples and pears.
- Interpretation and evaluation of the data, making comparisons within the sample, with conventional production and with other organic enterprises. Policy implications were drawn.
- Disseminating the data through an annual report.

The aims and objectives have all been met in full.

Methods and approaches

Detailed information was collected for the 2001-2003 harvest years from a group of five specialist organic top fruit farms. This included cropping details, yields from each orchard, sales to different outlets and prices obtained, marketing costs, cost of materials, tree management (pruning, picking, grading and storage), overhead costs (labour, machinery, rent and administration), cropping systems and age of orchards, and costs of establishing new orchards. Economic data was collected according to Farm Business Survey (FBS, DEFRA, 2003) techniques. In addition to recorded income and expenditure, all farms were treated as tenanted, therefore a rent figure was imputed where land was owned. Machinery and orchard depreciation were added, interest payments were excluded and a value placed on all unpaid labour including that of the farmer and family.

Top or orchard fruit refers to dessert apples, dessert pears, culinary or processing apples, plums and cherries. This study concentrates on organic dessert apples and pears since they are more commonly grown (table 3) and for which data was available.

All the farms surveyed were located in the South-East, where the highest proportion of top fruit orchards (conventional and organic) are located. The farms were located on a variety of soil types with some having more favourable soils; fertile and freely draining, and more favourable sites in terms of having a good flow of air through the orchards. All the farms classified as commercial top fruit holdings, according to FBS classifications, whereby two thirds of the standard gross margins of the farm is accounted for from these crops. The total organic orchard area surveyed was 106 ha, with average areas of 17 ha of dessert apples and 7 ha of dessert pears per farm. Three of the farms were fully organic and the remaining had organic orchards of 2-3 ha. A total of five farms is a relatively small sample, however, bearing in mind the small number of farms involved in commercial organic top fruit production, (estimated at less than 20), it is representative.

Since the farms were not all completely organic it was decided to concentrate on enterprise rather than whole farm performance. In order to interpret enterprise performance, the data was analysed in gross and net margin format on a pence per kg basis, a full costs accounting technique developed in the UK for analysing the profitability of top fruit (Knight, 1995). This results in a net margin bottom line figure per hectare and pence per kilogramme produced. The Net Margin from these calculations is equivalent to management and investment income in FBS.

In addition to the economics of production this report charts the growth of the UK organic top fruit industry from 2001-2003 and seeks to explain some of the reasons for it. It also examines the growth and characteristics of organic top fruit production in the UK, concentrating on dessert apples and pears. It analyses the market outlets where organic top fruit are sold.

The project has been led by HDRA who have conducted most of the work. The ADAS fruit team and the Institute of Rural Sciences at Aberystwyth, Wales have acted as advisors. During the course of this project HDRA has also been involved in another project on organic apples production; the DEFRA Horticultural LINK project 'Varieties and Integrated Pest and Disease Management for Organic Apple Production (HL0150LOF)'. HDRA has been directly involved in the varieties work and in conducting an economic analysis of various trials; therefore there has been a certain amount of information sharing between the two projects.

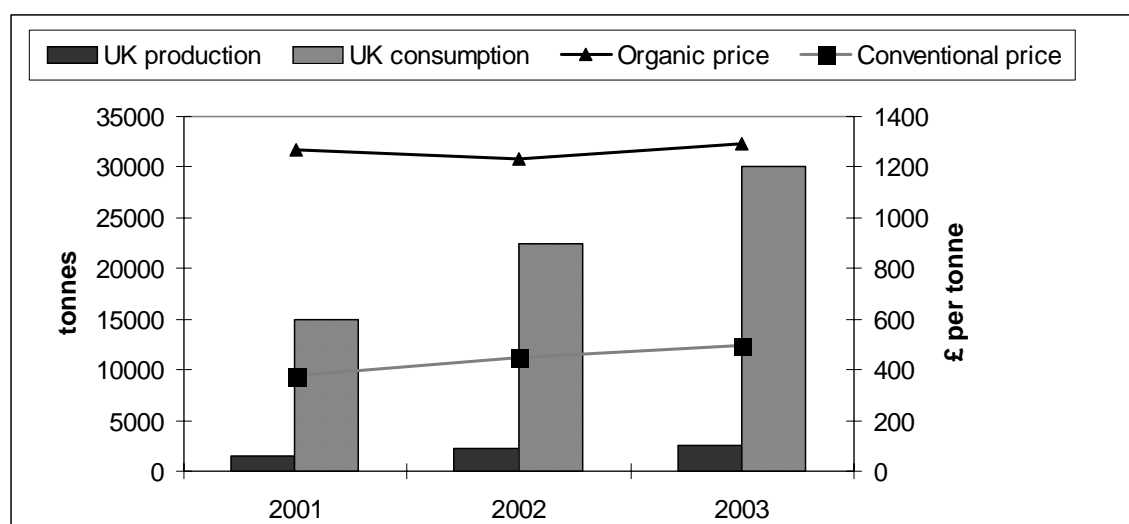
The results

The UK organic top fruit market

In 2003 the total market for organic food and drink in the UK reached a retail value of £1.015 billion (Soil Association, 2003). From 2001-2003 the overall market for organic food grew at a rate of 10% per annum. However, the organic top fruit market rose at a faster rate than the rest of the organic food market (for apples see Table 1), with the market rising by 50% per annum. In 2003 the market for organic top fruit, with an estimated retail value of £67 million (Organic Monitor, 2003) and 7% share, is one of the largest organic product groups in the organic market.

The fact that organic fruit has been identified as an important 'entry point' category for consumers starting to buy organic food could explain the faster growth rate for organic fruit, and means that fruit is likely to play an important part in the future growth of the organic food sector. The increase in the market has been prompted by a number of factors relating to increasing consumer awareness of food safety, health and environmental issues, food scares, fear over the use of pesticides and the use of Genetically Modified Organisms (GMOs) in conventional food production. The stronger supermarket presence in the market towards the end of the 1990s also assisted market growth by making organic food more widely available. It also removed some of the impediments to market growth, which included inconsistent supplies and poor quality (Organic Monitor, 2001).

Table 1: UK market for organic dessert apples¹ 2001-2003



⁽¹⁾ Source of 2001, 2002 data ADAS. There is less detailed information available for organic pears)

Characteristics of the UK organic top fruit industry in comparison to other European countries and conventional production.

Within the EU (Jan 2004), the largest areas of land devoted to organic tree/top fruit production (Table 2) are in Southern Europe and France. The leading area is in Italy, followed by Portugal, France, Spain and Germany (Lindhard, 1999).

In 2003 a total of 1187 hectares of organic top fruit were grown in the UK, with an estimated 6822 tonnes of fruit produced with a retail value of £6.7 million. Apples account for 82% of the organic top fruit produced in the UK (Table 3). This accounts for 10% of the market for organic top fruit, with the remainder being imported. This compares with 21% for conventional apples and pears (DEFRA, 2004). Therefore the UK produces only a small share of the total market, with the majority being imported from other parts of the world, such as other parts of Europe, the USA, New Zealand and South America. It does appear that these countries have more favourable climatic conditions for the production of organic fruit, in terms of more sunshine and less damp conditions in the early growing season. They do have more pest problems, which can be controlled by spraying, but fewer diseases.

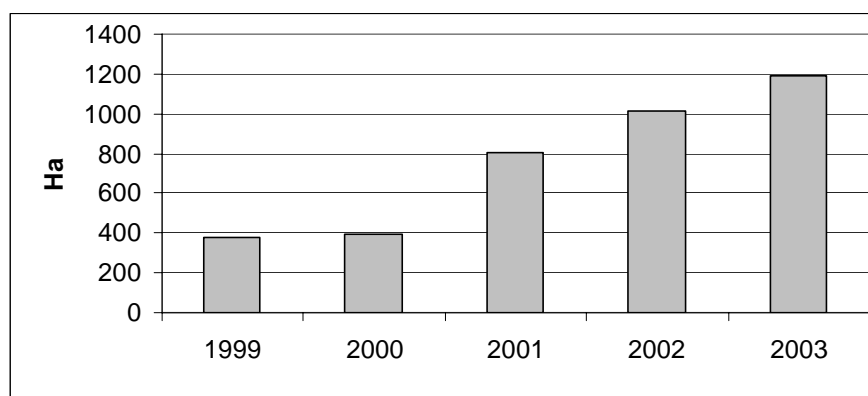
Table 2: Production area, crop and subsidies for organic tree fruit production in Europe

Country	Production area (ha)	Crop	Subsidises euros/ha
Portugal	16,333	Olives, grapes	180-603
Spain	2,215	Apples, pears, peaches citrus, olives	460
Italy	152,000 (including vegetables)	Olives, grapes, citrus, apples	460
Greece	Several hundred	Olives, grapes	Grapes 608
France	7,000	Chestnut, apples, pears, peaches, plums, apricots, cherries	762 for first 3 yrs
Switzerland	360, + 6-8,000 ha pip fruit	Apple, pears, apricots, cherries, plums	1200
Austria	598	Apples, pears	727
Belgium	209	Apples, pears	744 first 2 yrs, then 842
Germany	980	Most fruits	511
The Netherlands	320	Apples, pears	1,344 first 3 yrs
United Kingdom	1187	Apples, pears, plums,	2734 over first 5 yrs, then 44/annum
Denmark	306	Apples, cherries	406 for 2 yrs, then gradual reduction to 0
Norway	57	Apples, pears, plums	727 first 2 yrs, then 182
Sweden	189	Apples etc	0

(Source: Weibel, 2002, and updated with UK data 2003)

In the UK, organic top fruit is one of the few areas within the overall top fruit industry that is currently enjoying expansion, albeit on a small scale, against a background of decline in overall orchard area. It is estimated that there has been a loss of 70% of UK conventional orchards in the last 50 years. The total area of conventional and organic top fruit orchards is 19,016 hectares (DEFRA, 2004), organic area represents 6% of this.

The area of organic top fruit in the UK has grown by 38% per annum over the past five years rising from 322 ha in 1998 to 1187 ha in 2003 (Figure 1), with the most rapid increase occurring during 2001-2003. Many growers entered their orchards into conversion in 1998 (when the organic market was just getting going) and therefore 2001 saw a substantial rise in the area of top fruit under organic production when these orchards achieved full organic status.

Figure 1: Area of organic top fruit 1999-2003 in the UK (Source: Soil Association, 2003)

Although demand for organic fruit increased in the 1990s, the rate of conversion of UK growers to organic top fruit production was relatively slow. There were a number of reasons for this. Firstly, the high costs of conversion to organic production, estimated to be £6,800/ha over 3 years for the conversion of an existing orchard (Firth, 1999), largely due to the inability to mainly due to the fall in marketable yield during the conversion period, and the cost of establishing a new orchard greater than £10,000/ha. Secondly, there was a lack of technical knowledge and advice, particularly in relation to control of pests and diseases. This made it difficult for growers to achieve the high cosmetic requirements for fruit destined for sale through the supermarkets. Thirdly, many of the varieties widely grown by conventional growers were unsuitable for organic production. There was also insufficient knowledge on other varieties, which may have been more suitable. These obstacles combined to constrain the growth of conversion to organic production.

Since 2001, the rates of conversion to organic production have increased (Figure 1), partly in response to increases in government subsidies, which rose from £250/ha (UK Organic Aid Scheme) in 1995 to £450/ha in 1999 (Organic Farming Scheme), payable over 5 years. Supermarkets have also encouraged some of their conventional suppliers to switch to organic production and have been prepared to pay a premium for 'in-conversion' fruit. Cider producers, notably through the company Bulmers, have also encouraged the conversion of old cider orchards to organic production. The area of processing apples represents over half of the top fruit area (Table 3). The effect of an even higher increase in government subsidy introduced in 2002 has yet to be ascertained; the rate in England rose to £1860/ha (over five years) as part of its Organic Action Plan and additional land maintained in organic farming was then entitled to payments of £30/ha per year for continued organic production. The level of UK subsidies is now above the average for other EU countries (Table 2).

Sales of food in the UK are predominately through supermarkets (81%), with smaller amounts being sold through wholesalers and independent retailers (10%) and through direct sales such as box schemes, farm shops and farmers' markets (9%), (Soil Association, 2003). However, results from this survey indicate that sales of UK produced top fruit may follow a slightly different pattern, (see production economics section – page 9). UK top fruit is typically sold between August and November and imported at other times of the year, so little is stored for long term (post-Christmas).

Table 3: Estimated area and tonnage of UK produced organic top fruit 2001-2003.

Type of fruit	2001		2002		2003	
	hectares	tonnes	hectares	tonnes	hectares	tonnes
Apples-dessert	240	1500	304	2250	356	2500
Apples-processing	418	1600	526	1920	617	3085
Pears	80	500	101	630	119	952
Plums	48	100	61	105	71	213
Cherries	16	25	20	25	24	72
Total	802	3725	1012	4930	1187	6822

(Source: ADAS 2001 and 2002, 2003 HDRA)

In 2003 it was estimated that a total of 6822 tonnes of organic top fruit was produced from 1187 hectares of organic top fruit orchards (Table 2). This represents a 4% share of the total of 173,800 tonnes of top fruit produced in the UK (both organic and conventional). There were 500 registered holdings (farms) growing organic top fruit. Ninety of these holdings consist of cider orchards. The majority of dessert apple and pear orchards remain very small (less than 3 hectares in size), and it is estimated that there are fewer than 20 growers specialising in organic top fruit, and supplying the bulk of the volumes to the dessert fruit market. Organic fruit growers may also be sub-divided into those who have converted for more philosophical reasons and those who have converted more recently for more commercial reasons; this can affect their approach to use of inputs, and the markets they supply. Organic orchards are found in the main top fruit growing regions of the UK: The South East (Kent and Sussex), East Anglia (Suffolk, Norfolk and Cambridgeshire) and the West Midlands (Herefordshire and Worcestershire). The majority are found in the South East.

Production economics of dessert apples and pears

The on-farm economics of organic apples and pears is largely determined by the level of yields for the fresh market (reaching EC class I & II), prices and costs of production. This section will examine what influences each of these have in organic fruit production in the UK.

Yields

The UK climate, with its variable spring and summer weather pattern (rainfall, sunshine and temperature), has a direct bearing on orchard yields. The weather also indirectly affects yields through its influence on pest and disease levels, which have a major effect on marketable yields. Yields per hectare also vary with variety, soil type, farm site, rootstock, planting density, and age of trees.

Organic apple survey yields were found to be 50-80%, and pears 25-55% of conventionally managed orchards although there was considerable variation between varieties and different farms (Table 4 and Fig 2). There are several possible explanations for this. Firstly, specialist UK organic top fruit farms typically contain orchards with up to 10 different varieties of apples and up to three different varieties of pear. Many of these orchards contain a large proportion of varieties, such as Cox, which are less suitable for organic production systems. Only 20% of the varieties in the survey farms had been specifically planted for organic purposes. Secondly, a large proportion

(80%) of the orchards contained trees which had been previously managed under conventional methods before conversion to organic production. Sometimes the trees were on inappropriate rootstocks. The average age of the orchards in the survey was 14 years, which also contributed to the low level of recorded yields, (an orchard is usually at its peak from 8 to 12 years of age). The average planting density for all the orchards in the survey was 1106 (range 736-1475) trees per hectare. In comparison with many planting systems in other parts of Europe, this system could be considered to be extensive.

As regards seasonal differences, 2001 was a relatively good fruit growing year resulting in relatively few pests and diseases and good fruit quality, although sooty blotch, apple blossom weevil and wood scab on pears were noted to have caused economic losses on some farms. 2002 had a very wet spring, which resulted in major problems with scab in both apples and pears, resulting in some very low yields from susceptible varieties. Nutrient analysis of leaves and fruit from some of the farms showed that many organic orchards were low in nutrients, particularly nitrogen, and this continues to be a factor which constrains yields (Cross et al, 2002). In contrast, 2003 was very warm and dry with fewer disease problems and much higher yields in both organic and conventional orchards.

Table 4: Average organic dessert apple and pear total yields by variety (t/ha) 2001-2003

	2001	2002	2003
Apples			
Fiesta (Red pippin)	9.60	14.00	22.00
Cox	2.34	2.50	10.00
Saturn	5.00	11.00	10.60
Falstaff	7.00	11.00	10.00
Egremont russet	3.00	6.50	4.90
Worcester	2.50	2.90	4.00
Gala ²	15.00	12.00	15.00
Jonagold ²	21.00	26.00	23.00
Discovery	3.00	19.00	19.00
Spartan ²	4.47	5.80	10.00
Average all varieties ¹	7.97	9.11	10.22
Conventional yields ³	15.75	14.93	12.4
Pears			
Conference	4.00	11.40	10.23
Concorde	na	6.00	2.80
Average all varieties ¹	3.74	6.96	9.33
Conventional yields ³	16.35	16.75	17.00

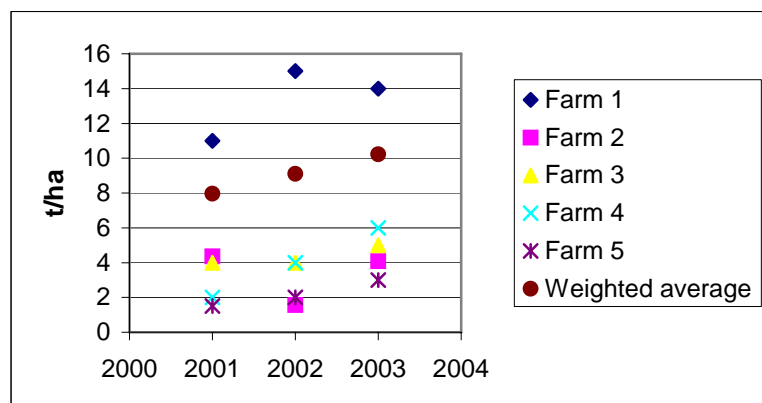
¹ This average contains varieties not listed in this table and is weighted according to area grown.

² Orchards still in conversion in 2001

³ DEFRA (2004)

Other varieties grown: Charles Ross, Ida Red, and Adams's Pearmain. New plantings have been made of Topaz and Pinova on one farm.

Fig 2: Average annual organic apple yields per farm 2001-2003



Prices

Prices to supermarket outlets for a combined Class I & II ranged from 0.59-1.69 pence/kg and 1.10 pence/kg for wholesale outlets. The variation in supermarket outlet price was related to variety with some commanding a high price (Spartan) and others a low one (Russet). Organic top fruit prices are commonly double those of conventional ones. There is also a premium for UK produce over imported fruit. Prices obtained for apples sold for processing, mainly for juice, were: off-farm processing 15 pence/kg and where processed on-farm 93 pence/kg. Many organic top fruit farms have juice-processing facilities on the farm and this provides a valuable means of adding value to the apples and pears that do not reach the quality specifications of the fresh market. In 2001-2003 organic fruit from the surveyed farms was sold to the following outlets; 43% to supermarkets, 20% to wholesalers and direct sales, and 37% sold as juice (95% of this being processed on the farm where it was grown). Some fruit was sold in-conversion at prices approximately half that of organic fruit.

Gross income

Average gross incomes from organic apples and pears were mainly higher or comparable to conventional ones since the higher prices more than compensate for the lower yields. The greatest variation in income from individual organic orchards, varieties, farms, and years was caused by differences in the total yield and the proportion of the yield which reached Class I & II (this is typically 60-70% for apples and 60-85% for pears). Prices were more stable. Where fruit was processed into juice and bottled on the farm, this proved a very valuable way of maintaining gross income. The highest prices and gross income were obtained from fruit sold to supermarkets, although the higher marketing costs of this route to market often cancelled this benefit out.

Costs of production

The table below shows the average returns and costs for all the organic dessert apple and pear orchards in the survey.

Table 5: Average income and costs from dessert apples and pears 2001-2003¹

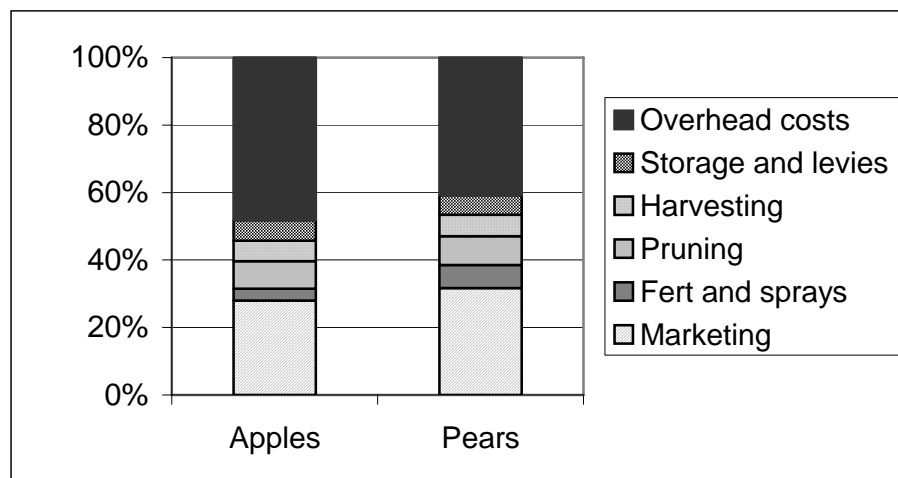
	Apples £/ha	Pears £/ha
Yields (tonnes/ha)	9.10	6.70
Class I & II (%)	66	66
Processing (%)	34	34
GROSS INCOME (£/ha)	6920	6701
Gross returns (p/kg)	0.76	1.00
COSTS		
Total Variable costs	3439	3778
Variable costs (p/kg)	38	57
GROSS MARGIN/(£/ha)	3481	2923
Overhead costs	3026	2476
TOTAL COSTS	6465	6386
Total costs (p/kg)	71	96
NET MARGIN (£/kg)	455	315
Net margin (p/kg)	5	4
Percentage return on costs	7	5

¹ Refer to more detailed tables 6&7 in appendices

Across the various farms costs were fairly similar, variations did occur according to type of market outlet used. The greatest costs (Figure 3) were for marketing (30% or 20p/kg) and overhead costs (44% or 33p/kg – regular labour, machinery, rent, orchard depreciation and general fixed costs). Top fruit growing is very labour intensive and labour accounted for 30% of costs. Labour costs were £1750/ha, which was comparable with conventional data of £1764/ha (Vaughan, 2003). This represented on average 0.15 Full Time Equivalent (FTE) labour units per ha and would represent a total of 3.5 labour units per farm for a 24 ha farm with orchards growing both apples and pears. Many of the routine operations such as pruning and harvesting were done by casual or contract labour and paid for on a piece rate basis. Many of the costs (50%) such as marketing, grading and packing and harvesting vary directly with the yield, and therefore are very similar to those incurred in conventional fruit growing. However, differences occur in relation to use of inputs; costs of fertilizers and sprays account for a small percentage (2-3%) of the total costs. Organic top fruit growers typically apply compost, manures and seaweed extract as nutrients and use mainly copper, sulphur, *Bacillus thuringiensis* (*Bt*) and Pyrethrum sprays to help

control pests and diseases. There are currently insufficient products or tools as a means of reliable control in a bad pest and disease year. The main method of weed control used is to mow the grass under-storey around and under the trees in the orchards, some growers have also tried the use of plastic mulches and flame burners to suppress weeds and grasses. With average current prices and costs a breakeven point (where income equals costs) can be achieved at 7t/ha for apples and 5t/ha for pears.

Figure 3: Breakdown of costs of organic dessert apple and pear production 2001-2003



Gross and net margins and overall profitability

The average gross margins for both organic apples and pears were above the level of conventional equivalents (table 8) and comparable with other organic horticultural enterprises (table 9). Average net margins for apples were £455/ha and 5p/kg and gave a 7% return on total costs and pears £315/ha and 4p/kg and a 5% return on total costs for the years 2001-2003 (although pears made a loss in 2001). Comparable conventional data is not available at net margin level. However, in business terms a 15% return on total costs would have been regarded as profitable. The averages, however, fail to show the large range of results that occurred between the individual crops and farms. During the period 9 apple and pear crops (a crop includes all varieties on an individual farm), which represent 43% of all the crops grown in the three years, made a loss. As costs were fairly similar, the variation in net margins is directly related to the variability in yields as illustrated in Table 4 and Fig 2. Some farms did notably better than others and this is in part due to their more favourable site for fruit growing (better soils and orchards with better air flow through them). Since the better performing farms were producing on a larger area this did bias the average in their favour.

Existing returns on some farms did not provide sufficient additional income to enable growers to invest in new orchards. The variability of economic returns is still proving to be a constraint to new top fruit growers converting to organic production. It is of some concern that profitability is currently highly dependent on high prices for organic fruit, which may fall as UK supplies increase. A 20% reduction in prices for apples would lead to a halving of net margin and a 45% reduction would lead to all farms making a loss. Therefore, there is some urgency to discover both more suitable varieties for organic production and also to discover more reliable methods of pest and disease control in order to ensure higher and more consistent yields.

Conclusions

- There is a growing market for organic apples and pears, from both supermarkets and increasing direct sales outlets, with attractive prices for UK grown organic fruit, commonly double that of conventional, which create a potential to earn economic returns.
- A small number of UK top fruit growers (accounting for 1187 ha or 6% of the total top fruit area) have converted to organic production. Most of them have converted existing conventional orchards rather than replanting with more suitable organic varieties. UK organic top fruit supplies 10% of the market with the remainder being imported, in comparison with 21% in the conventional sector.
- With current prices and costs of production a breakeven point can be achieved by obtaining yields of 7t/ha apples and 5t/ha pears. Although averages from this survey are above these figures many growers are falling below this economic threshold.

- A combination of factors is resulting in many farms not being able to achieve consistent marketable yields and economic returns. This is related to: firstly, the fact that many organic orchards contain varieties which do not perform well under organic conditions and are susceptible to pest and diseases, making it hard for the fruit to obtain the cosmetic requirements of the supermarkets. (Direct sales market outlets may offer new opportunities for this type of fruit). Secondly, yields are also constrained by lack of nutrients which is in turn related to poor weed control.
- Existing returns on many farms do not provide sufficient additional income to enable growers to invest in new orchards. The variability of economic returns is proving to be a constraint to new top fruit growers converting to organic production. The high costs of conversion to organic top fruit production are estimated to be £6,800/ha over three years for an existing orchard, with the cost of establishing a new orchard even higher than this (>£10,000/ha).
- Bearing in mind the high cost of conversion and the uncertainly over yields and economic returns, it is thought that even the increased rate of Organic Farming Scheme Payment of £1860/ha over five years (introduced in 2002) will not be sufficient financial incentive for top fruit growers to convert.
- These factors are all resulting in 90% of organic top fruit being imported into the UK.
- If UK organic top fruit production (currently supplying 10% of the market) was to be brought up to equal conventional levels of supply (21%), an estimated additional 1000 ha (at existing yields) would need to be converted to organic production.

Recommendations and policy implications

- Since there is a desire to see more UK organic top fruit in order to meet Organic Action Plan targets of obtaining similar levels of UK organic production to conventional levels, then government and business policy support for this fledgling sector must continue. Support can be provided through further funding for research and development and dissemination, and through co-ordination of efforts by government.
- New apple varieties identified in the Horticultural LINK project 273/3 UK, require further testing and verification in UK conditions, with support from packers and multiple retailers.
- Although the Horticultural LINK project 273/3 UK brought some improved pest and disease control this work needs to continue especially since the use of copper, which is one of the most effective treatments for control of scab, mildew and canker, is likely to be removed in the future. Further research work is also required on the nutrition and weed control elements, to further aid the production of more consistent yields.
- Effective collaboration with other European research into varieties and pest and disease control should be fostered.
- Greater monitoring of the market should be undertaken in order to identify opportunities, and continued monitoring of the economics of production in order to provide growers with up to date market information.

Dissemination

The main dissemination from this project has been an annual report summarising the findings from each year of the study, these are available, together with details of the project, for download from HDRA's website (http://www.gardenorganic.org.uk/organicveg/research/show_project.php?id=12). In addition, a talk on the

economics of production has been given at a Soil Association Event on Organic Apple Growing in June 2004, and another on the Marketing of Organic Apples at East Malling Research Association on February 3 2005. Data gained from this project has enabled us to include organic apples and pears as new crop gross margins in the Organic Farm Management Handbook (Edited by N Lampkin, M Measures and S Padel) issued in 2002 and updated in 2004. A Paper based on the results from the study was given at the Intervitus Interfructa 2004 International Fruit Growing Conference held in Stuttgart, Germany 12/13 May 2004.

Appendices

Costs of production, gross and net margins

The table below shows the average returns and costs for all the organic dessert apple orchards in the survey.

Table 6: Average returns and costs of organic dessert apple production 2001-03

	2001 £/ha	2002 £/ha	2003 £/ha	Average 2001-3	Average p/kg	% total costs
Yields (tonnes)	7.97	9.11	10.22	9.10	-	-
Class I & II (%)	65	51	63	51	-	-
Processing (%)	35	49	37	40	-	-
GROSS RETURNS	6383	5864	8513	6920	76	-
COSTS						
Commission	280	283	390	318	3	5
Transport	281	296	366	315	3	5
Packaging	321	259	436	339	4	5
Grade and pack	339	290	416	349	4	5
Others (incl. Processing)	165	234	905	411	5	6
Total marketing costs	1387	1363	2513	1754	19	27
Fertiliser	34	48	132	71	1	1
Sprays	185	136	103	141	2	2
Others	0	98	91	63	1	1
Total materials	219	204	251	225	2	3
Pruning costs	405	521	602	509	6	8
Picking	315	290	356	321	4	5
Bin hire/depreciation	100	19	67	62	1	1
Total harvesting costs	415	309	989	571	6	9
Levies	28	39	86	51	1	1
Storage	284	263	441	329	4	5
Total Variable costs	2738	2699	4881	3439	38	53
GROSS MARGIN	3645	3165	3632	3481	38	
Other labour (inc farmer)	1057	1078	756	964	10	14
Power and machinery	716	715	623	685	8	11
Insurance	132	126	91	116		
Rent	300	278	302	293	3	5
Property repairs	46	56	56	52	1	1
Prof. and advisory fees	128	119	110	119	1	2
Orchard depreciation	395	400	421	406	4	6
Total overhead costs	3191	3121	2767	3026	33	47
TOTAL COSTS	5929	5819	7648	6465	71	100
NET MARGIN/ha	454	44	865	455	5	
Average apple area (ha/farm) in survey	15.8	17	17.53	16.77		
Net Margin/farm	10577	2780	17165	10174		
FTE labour units/ha	0.14	0.17	0.15	0.15		
Net income/labour unit	8057	375	6635	5023		

Table 7: Average returns and costs of organic pear production 2001-03

	2001 £/ha	2002 £/ha	2003 £/ha	Average 2001-3	Average p/kg	% total costs
Yields (tonnes)	3.74	6.96	9.33	6.7	-	-
Class I & II (%)	82	51	65	66	-	-
Processing (%)	18	49	35	34	-	-
GROSS RETURNS	4228	6775	9101	6701	100	-
COSTS						
Commission	271	358	547	392	6	6
Transport	248	341	511	367	5	6
Packaging	274	385	564	408	6	6
Grade and pack	339	412	694	481	7	8
Others (incl. processing)	84	167	584	261	4	4
Total marketing costs	1217	1663	2899	1926	29	30
Fertiliser	30	26	323	126	2	2
Sprays	120	314	386	273	4	4
Others	0	0	51	17	0	0
Total materials	150	340	759	416	6	7
Pruning costs	432	529	597	519	8	8
Picking	173	343	461	326	5	5
Bin hire/depreciation	22	80	65	56	1	1
Total harvesting costs	195	424	1064	561	8	9
Levies	45	68	78	64	1	1
Storage	145	321	409	292	4	5
Total Variable costs	2184	3344	5807	3778	57	59
GROSS MARGIN	2044	3431	3294	2923		
Other labour (inc farmer)	848	1109	776	911	14	14
Power and machinery	453	352	804	536	8	8
Insurance	61	61	59	60	1	1
Rent	300	278	302	293	2	3
Property repairs	248	54	34	112	4	5
Prof. and advisory fees	82	132	130	115	2	2
Orchard depreciation	400	377	400	392	6	6
Total overhead costs	2523	2589	2711	2476	39	41
TOTAL COSTS	4708	5933	8518	6386	96	100
NET MARGIN/ha	-479	842	583	315	5	
Average pear area (ha/farm) in survey	7.56	7.7	6.62	7.29		
Net Margin/farm	-2381	6023	4425	2689		
FTE labour units/ha	0.13	0.17	0.16	0.15		
Net income/labour unit	-3800	4894	3661	1585		

Table 8: Comparison of conventional and organic top fruit gross margins²

	Dessert apples		Pears	
	Conv ¹ .	Organic	Conv ¹ .	Organic
Yield	14	9.10	13	6.7
Price	400	760	350	1000
Output	5600	6920	4500	6701
Variable costs:				
Fertilizer	75	71	75	126
Sprays	400	141	350	273
Packaging	450	339	475	408
Casual labour	1450	830	1350	845
Total variable costs	2375	1381	2250	1652
Gross Margin	3225	5539	2300	5049

¹ Conventional data obtained from Nix J 2005

² Gross margin data is on format in Nix J 2005 for comparison purposes.

Table 9: Comparison of organic apples and pear gross margins¹ (£/ha) with other organic horticultural enterprises

Crop	Apples	Pears	Strawberries	Vegetable Rotation ² (5year)
	£/ha	£/ha	£/ha	£/ha
Output	9884	8700	23467	3385
Variable costs	6018	5018	12437	1368
Gross margin	3867	3682	11741	2017

¹ Based on Organic Farm Management Handbook format (Lampkin, 2004)

² Average from a specialist vegetable rotation, which includes grass clover leys (Lampkin, 2004)

References to published material

9. This section should be used to record links (hypertext links where possible) or references to other published material generated by, or relating to this project.

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Information on the project, annual reports and the above paper are available on the HDRA/Garden Organic website:
http://www.gardenorganic.org.uk/organicveg/research/show_project.php?id=12