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The challenges and potential benefits of perennial organic cropping systems-example of organic top fruit

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Summary

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, UK production remains small and 90% of supplies are imported. Current methods of production are unsatisfactory with low yields and erratic quality, with resulting variable economic performance. Pest and disease problems are one of the main reasons for this poor performance, with current varieties being unable to provide sufficient resistance. New varieties and an improved pest and disease management programme, identified as part of a HORTLINK project, offer new hope to the sector. There are now opportunities for the sector to grow and provide greater UK supplies of top fruit, in addition to widening the proven benefits to biodiversity of organic orchards.

Key words: Organic, apples, pears, varieties, economics, biodiversity

Introduction

Without the ability to rotate crops, the commercial growing of organic perennial crops represents a challenge. Despite the rapid growth in demand for organic top fruit (apples, pears, etc) the UK supply base remains relatively undeveloped and the majority of fruit is imported. Organic fruit growers have been hampered by lack of suitable varieties and the ability to control pest and diseases, which make it difficult to achieve acceptable fruit quality. Other challenges are weed control and providing sufficient nutrients to sustain regular cropping. As perennial cropping systems, with fruit trees *in situ* for 15–30 years, there is no ability to rely on crop rotation, which is central to maintaining soil fertility, and controlling pests, diseases and weeds in most other organic cropping systems. Yet these cropping systems have potential to provide a greater quantity of UK supplied fruit and give significant biodiversity benefits. This paper will examine recent research conducted by Henry Doubleday Research Association (HDRA) and East Malling Research (EMR) to address some of these issues.

Methods

EMR and HDRA have jointly undertaken a DEFRA funded Horticultural LINK project from

2000-2005, with two major objectives: firstly to develop an effective integrated pest and disease management programme and secondly to identify varieties suitable for organic production. For the first objective; two field scale experiments were conducted on two organic top fruit farms, one in an orchard of a disease susceptible variety (Fiesta), which had converted from conventional production, and secondly on a farm with a newly planted orchard of chosen pest and disease resistant varieties (Topaz and Pinova). For the second objective over 150 varieties, including ones grown in other European countries, were screened for known pest and disease resistance. From this, 20 promising varieties were short-listed and planted out in a new orchard for further evaluations, including consumer acceptance. Using some of these orchards, an arthropod biodiversity survey was conducted in 2002 and comparisons made with conventional and unsprayed orchards. Aspects examined included species diversity, abundance, structure and composition. Methods used were beat sampling, yellow sticky and pitfall traps. Finally, a survey into the economics of top fruit production was conducted from 2001–2003 harvest years, collecting detailed information from a group of specialist organic top fruit farms. Economic data was collected according to Farm Business Survey techniques, and presented as net crop margins on a full cost accounting approach.

Results

Characteristics of the UK top fruit industry and the market

In the UK, organic top fruit is one of the few areas within the overall top fruit industry that has enjoyed 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 16,894 hectares (Defra, 2005); the organic area of 1244 ha represents 7% of this.

In 2006 the market for organic top fruit, with an estimated retail value of £67 million and at a 7% share, is one of the largest organic product groups in the organic market. In 2005 a total of 1244 hectares of organic top fruit were grown in the UK, with an estimated 6531 tonnes of fruit produced with a retail value of £9.7 million. Apples account for 92% of the organic top fruit produced in the UK (Table 1). 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, 2005). 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.

Table 1. *Breakdown of UK organic top fruit area, tonnes and farm gate value, 2005/06*

	Area (ha)	Tonnes	Farm gate value (£)
Dessert apples	396	1950	2,030,000
Cider and processing apples	674	4038	1,279,800
Pears	111	333	366,000
Cherries	20	60	217,500
Plums	30	90	241,000
Other	20	60	174,000
Total top fruit	1244	6531	3,872,400

The area of organic top fruit in the UK has grown by 38% per annum over the past six years rising from 380 ha in 1999 to 1244 ha in 2005 (Fig. 1), with the most rapid increase occurring during 2001−2003. This followed the increased of the rate payment for conversion from £250 to

£450 ha^{-1}, in 1999 under the Organic Farming Scheme. The greatest increase in area grown has come from cider and processing apples, where there has been much encouragement to convert to organic production from the processing industry.

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^{-1} over 3 years for the conversion of an existing orchard and over £10,000 ha^{-1} for establishing a new orchard (HDRA, 2006). Even the higher rates of conversion payments of £1860 ha^{-1} introduced in 2004, will make little contribution to these. 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 have combined to constrain the growth of conversion to organic production.

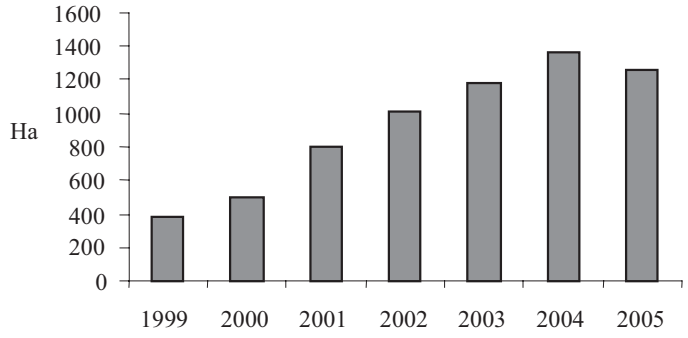

Fig. 1: Area of organic top fruit 1999–2005 in the UK.

Improved varieties and integrated pest and disease management

Research in the HORTLINK project has developed improved approaches to reduce the damaging effects of diseases such as scab and mildew, and pests such as apple blossom weevil. These improvements have largely been through the use of improved cultural methods, and better timing and rates of permitted plant protection products such as copper, sulphur, and pyrethrum. However, the use of copper is now being restricted and under organic standards is likely to be withdrawn in the future. Also, many of the other products can only offer partial control of some pests and diseases and therefore long-term solutions will only come through the use of disease resistant varieties, which are less susceptible.

Over 150 potential apple varieties were identified for their suitability for organic production through literature, expert knowledge of scientists and those in the industry both in the UK and the Europe. A short-list of 29 were planted out in an orchard for further evaluation under organic growing conditions where agronomic assessments of pest and disease resistance, tree habit and vigour, bloom density and yield were recorded. Selection criteria for varieties were a good balance of fruit quality characteristics (colour, shape, firmness, juiciness and taste-suitable for supermarket sales), resistance or tolerance to scab and mildew, no great sensitivity to important pests and pathogens such as canker, ability to yield precociously, productively and consistently with well sized fruit (> 60 mm) and suitable for short and long term storage. Finally, after completing a large-scale consumer acceptance test with the major retailers Sainsbury's and Waitrose, a list of five dessert, four culinary and two juicing varieties were recommended to UK organic growers.

Table 2. *HORTLINK project (HL0150LOF) recommended varieties for organic production*

	Variety	Harvest time
Dessert	Ceeval	Early season
	Rajka, Resi, Rubinola	Mid season
	Rubinstep	Mid-late season
Culinary	Edward VII, Encore	Late season
	Howgate Wonder, Pikant	
Juicing	Red Falstaff/Fiesta	Mid season

Arthropod biodiversity

The main conclusions from the survey were that: a total of 345 Arthropod species were identified; for both *araneae* (spiders) and *heteroptera* (bugs), the organic and untreated orchards contained a greater abundance and greater diversity of species than the conventional one. There was a strong interaction between the canopy and herb layer for the spiders, and nine species of bugs and five of spiders were identified as potentially important natural enemies.

Economics of production

The on-farm economics of top fruit was largely determined by the level of yields of fruit for the fresh market. Where fruit was processed into juice and bottled on the farm, this proved a very valuable way of maintaining total farm income. Prices were typically double those of conventional ones and 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). 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.

Across the various farms, costs were fairly similar. The largest proportion of costs was for marketing (30%) and overhead costs (44%). Top fruit growing is very labour intensive and labour accounted for 30% of on-farm costs. Average net margins for apples (£455 ha^{-1}, 5 p kg^{-1}) gave a 7% margin over costs, and pears (£315ha^{-1}, 5 p kg^{-1}) 5% for the years 2001–2003. A 15% rate would have been regarded as very profitable. However, the averages fail to show the large range of results that occurred, and that during the survey 43% of the crops grown made a loss.

Conclusions

There is a growing market for organic top fruit, with attractive prices for UK grown organic fruit, which creates a potential to earn economic returns. A small number of UK top fruit growers 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. A combination of factors is resulting in many farms not being able to achieve consistent marketable yields and economic returns. Existing returns on many farms have not provided 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. Thus, the benefits of enabling more UK produce to meet consumer demand, with associated environmental benefits of fewer food miles and greater biodiversity are not being met. The key factor is that currently most 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 achieve the cosmetic requirements of the supermarkets. The recently completed HortLINK research project, which has identified

new varieties and improved pest and disease control, should help provide new opportunities for organic growers and pave the way for increased production of homegrown organic fruit.

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