

Six hypotheses for profitable apple production based on the economic work-package within the ISAFRUIT Project

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SUMMARY

As a result of an economic analysis of apple farms in Switzerland, Germany, The Netherlands, and France, we identified six factors that can be influenced by apple producers that might impact the economic success of their orchard. The critical factors identified were: yield; quality of the apples (as graded results); orchard size; number of cultivars; production costs; and specialisation in organic production and/or farmgate sales. Yield and graded results were the most important factors for the economic success of an orchard. Orchard size and production costs only affected the economics of an orchard under different conditions such as the size of the apple surface, or poor yield. The number of cultivars did influence the economic success of an orchard. Apple farms under organic production regimes and farmgate sales benefited from higher prices and, therefore, had a higher chance of economic success. The main condition for success was to maintain high product prices.

In order to maintain the profitability of their orchards, European apple producers must constantly make decisions about their production strategies. In this analysis, we formulated six hypotheses, based on research conducted under the European Union ISAFRUIT Project of the 6th Framework Programme, to help farmers in decision-making about their orchards. The economic part of the ISAFRUIT Project was aimed at improving the management of integrated or organic fruit farms. Within the ISAFRUIT Project, those factors which had an important influence on farm income (also called success factors; Mouron and Carint, 2001) have been identified and were introduced in a general context at the farm level using the hypotheses.

Competitive fruit farming is an integral part of the systemic, holistic view applied in ISAFRUIT on how to increase the consumption of fruit, that has been produced in a sustainable way in European orchards. Furthermore, this study was integrated into general research to increase the sustainability of fruit-growing systems which did not stop at the farm gate, and included aspects of the farm economy (Bertschinger *et al.*, 2004).

From the research done within the ISAFRUIT Project, we have formulated the following six hypotheses:

Hypothesis 1: Yield influences the economic success of the orchard.

Hypothesis 2: Orchard size influences the economic success of the orchard.

Hypothesis 3: The number of cultivars influences the economic success of the orchard.

Hypothesis 4: The quality of the yield (i.e., graded results) influences the economic success of the orchard.

Hypothesis 5: Production costs influence the economic success of the orchard.

Hypothesis 6: Specialisation into organic production and/or farmgate sales influences the economic success of the orchard.

METHODS

For each of the six hypotheses listed above, a study of the literature, and results from different ISAFRUIT analyses over the past 3 years were compared to generate a statement on whether we accepted or rejected each hypothesis. From a representative survey of 182 Swiss apple farms that had adopted integrated production (IP), and 57 organic apple producers, we identified the crucial factors for apple production, and those strategies that affected these factors (Mencarelli Hofmann, 2008a). Within ISAFRUIT, we compared organic and IP methods on farms over 3 years (Bravin *et al.*, 2008). This part of the ISAFRUIT Project was accomplished at the Obstbauversuchsring des Alten Landes (OVR), in northern Germany. The outcomes were measured using gross margins as the economic key (Bravin *et al.*, 2008).

RESULTS AND DISCUSSION

Hypothesis 1: Yield influences the economic success of the orchard

Mouron and Carint (2001) identified yield as the third most important success factor, after the price and quality of the apples (i.e., graded results). Yield directly influenced earned income. In the ISAFRUIT study conducted among IP producers by Mencarelli Hofmann (2008a), 26% of those producers who responded confirmed that yield was an important factor for the economic success of their orchard. Unfortunately, this result could not be confirmed using regression analysis of the same sample of IP producers. However, using

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discriminant analysis between the more successful apple producers in the French-speaking part, and the less successful apple producers in the German-speaking part of Switzerland, Mencarelli Hofmann (2008a) showed that yield (in kg of Class I ha⁻¹) was significantly different. When Mencarelli Hofmann (2008b) analysed organic producers in the ISAFRUIT Project, the results of regression analysis with the logit model showed that yield was a significant success factor. The economic and ecological success of apple producers relied on high and stable yields (Mouron, 2005), and it was found that farms that invested time in pre-harvest work had higher yields and better quality apples (Mouron and Scholz, 2007). Görgens and Bokelmann (2000) also identified the critical success factors on fruit-growing farms in Germany. The results were that price and yield were the decisive starting-points for success.

In order to give an overview of the different opinions received, we have summarised whether an author accepted or rejected this hypothesis (Table I). Based on the investigations listed, Hypothesis 1 is accepted. To improve the viability of their orchard, farmers should use appropriate techniques to increase fruit yield and to minimise losses.

Hypothesis 2: Orchard size influences the economic success of the orchard

The Interreg Project “BOGO: Gemüse und Obst im Bodenseeraum” analysed apple farms on the German and Swiss sides of Lake Constance (Büchle, 2007). It was shown that apple producers on the Swiss side, who had more orchards, had higher profits compared to those with fewer orchards. On the German side, where orchard size was generally larger, the study did not find any difference in profit between apple producers with small or large orchards. However, farmers with large orchards had a greater chance of higher profit, but also had greater risks. Farm size and orchard area were not correlated with success (Mouron, 2005). However, Görgens (2007) showed that profits rose in proportion to orchard area, although he also declared that orchard and farm size were not a guarantee of success. Mencarelli Hofmann and Bravin (2008) showed, by means of economic regression analysis, that there was a relationship between apple orchard size and economic success. However, the results for organic apple producers were different, in that the size of the apple orchard was not significant (Mencarelli Hofmann and Bravin, 2008). Using data from 25 commercial apple producers who participated in the Support Obst Arbo (SOA) project, Leumann (2009) showed that there was no identifiable

relationship between orchard size and production costs. The results of this survey are shown in Table II.

On the basis of Table II, a clear statement on Hypothesis 2 could not be given. The samples were clearly different in the different studies. Büchle (2007), Mouron (2005), Leumann (2009), and Görgens (2003) used a sample of commercial apple producers. Mencarelli Hoffman (2008a) used a representative sample of apple producers with orchards ranging in size from 1 to > 10 ha, with 42% between 1 – 5 ha, 31% between 5 – 10 ha, and 27% over 10 ha. Only 50% of this sample represented commercial apple producers (Mencarelli Hofmann, 2008a).

Based on this information, we can not confirm Hypothesis 2; namely that apple orchard size has a significant influence on the economic success of the orchard. The hypothesis appears to be true, but only up to a critical orchard size. Mouron and Scholz (2007) confirmed that the orchard management abilities of the producers can reduce the risk to income. When a given orchard size was reached, orchard management became more important for success. We therefore have to refute this hypothesis for certain sizes of orchard.

Hypothesis 3: The number of cultivars influences the economic success of the orchard

Leumann (2009) analysed the numbers of cultivars grown on professional Swiss apple farms, and concluded that the number of cultivars should be between eight and ten, and that two of these cultivars should have market potential. Mencarelli Hofmann (2008a) could not identify whether or not the number of cultivars influenced the success of an orchard. However, from that ISAFRUIT study, we learned that the choice of cultivars demanded by consumers had a significant influence on the economic success of the farm (Mencarelli Hofmann, 2008a). In the representative sample of Swiss IP farmers, from the ISAFRUIT study, it was found that the number of cultivars grown on a farm had a normal distribution, around a peak of eight cultivars. We also analysed the relationship between yield and the number of cultivars. Both the median and the mean yield per cultivar on farms with the same number of cultivars showed a tendency for the yield to decline by increasing the number of cultivars on the farm (Figure 1). There may be two explanations for this. First, with more cultivars the orchard becomes more difficult to manage. Second, farmers also try new cultivars with a greater risk of loss, and so less yield. However, with an advised choice of a suitable cultivar mix in an orchard, farmers can allocate work peaks, reduce yield losses, and invest in successful

TABLE I
Published statements that accept or reject Hypothesis 1

Publication	Accept Hypothesis 1	Reject Hypothesis 1
Mouron and Carint (2001)	X	
Mouron (2005)	X	
Mouron and Scholz (2007)	X	
Mencarelli Hofmann (2008a) – Evaluation IP farmers	X	
Mencarelli Hofmann (2008a) – Regression analysis IP farmers		X
Mencarelli Hofmann and Bravin (2008) – Organic farmers	X	
Görgens and Bokelmann (2000)	X	

TABLE II
Published statements that accept or reject Hypothesis 2

Publication	Accept Hypothesis 2	Reject Hypothesis 2
Büchle (2007) for Switzerland	X	
Büchle (2007) for Germany		X
Mouron (2005)	X	
Görgens (2007)	(X)	(X)
Mencarelli Hofmann (2008a) – IP farmers	X	
Mencarelli Hofmann (2008b) – Organic farmers		X
Leumann (2009)		X

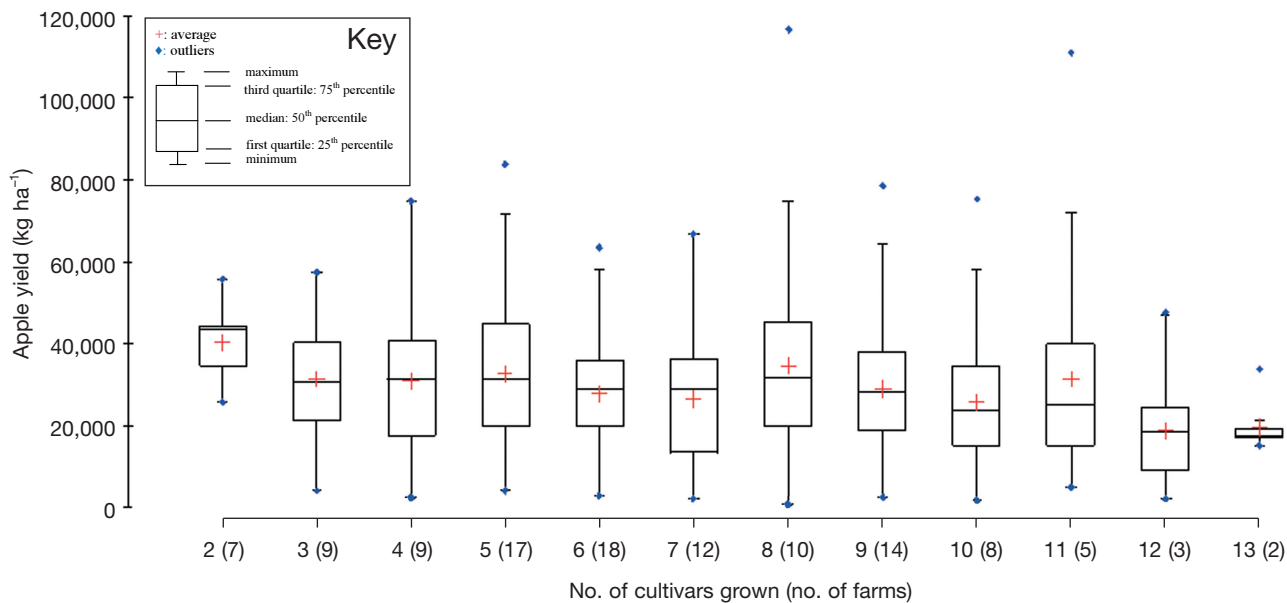


Fig. 1
Yields of apple (in kg ha⁻¹) in relation to the number of cultivars grown on each farm/orchard.

new cultivars (Mencarelli Hofmann, 2008a). Hypothesis 3 is therefore accepted. The number of cultivars does influence the economic success of an orchard.

Hypothesis 4: The quality of yield (i.e., graded results) influences the success of the orchard

In the ISAFRUIT survey among representative Swiss IP producers, farmers could evaluate whether or not they were satisfied with the economics of apple production; hence they could choose, among different factors, which were responsible for the success of their orchard (Mencarelli Hofmann, 2008a). Forty-five percent of satisfied, and 33% of unsatisfied farmers who responded chose apple quality as the most important factor that influenced the success of their orchard. Using regression analysis, the results showed that apple quality was not significant for the success of apple production (Mencarelli Hofmann and Bravin, 2008). The graded results collected during the ISAFRUIT survey on representative Swiss IP orchards showed an important characteristic. The portion in the best Class (the second most-important success factor for apple producers; Mouron and Carint, 2001) in 2005 and in 2006 was between 50% and 80%, and dependent on cultivar. The proportions of Class I fruit in cultivars such as ‘Golden Delicious’, ‘Jonagold’, ‘Idared’, and ‘Boskoop’ were between 50 – 60%. The requirements for these cultivars are high. If there are too many fruit on the tree, the proportion of Class I fruit production can be reduced. Farmers can improve their production by choosing cultivars such as ‘Braeburn’, ‘Gala’, or ‘Topaz’ which have better graded results. Grading remains one of the most important success factors, and can be influenced by choosing the right cultivar and applying professional fruit-growing practices. Hypothesis 4 is therefore accepted.

In discussions with producers, we noticed that many had a false impression of their own grading results. Farmers believed they had better grading results than they did. This was because apple producers often deliver

apples for processing separately, and do not include apples for processing in their grading results.

Hypothesis 5: Production costs influence the success of the orchard

Based on the full-cost calculation model for orchards, ‘Arbokost’, approx. 60% of orchard production costs are labour, of which is approx. 55% is pre-harvest labour (Bravin *et al.*, 2009). Mouron and Scholz (2007) showed that cost reduction played a minor role. More important, according to Mouron and Scholz (2007), were the pre-harvest labour hours required to maintain regular and high yield potential over several years. The conclusions of the ISAFRUIT study conducted by Mencarelli Hofmann (2008a) were different. It was found that production costs had a negative effect on the economic success of the orchard. In this analysis, 50% of unsatisfied farmers chose production costs as the most important factor for their discontent (Mencarelli Hofmann, 2008a). Although Swiss producers defined production costs as one of the most important components of the poor economic results of an orchard, the influence of production costs on the success of an orchard was actually less important than yield or management competence. Production costs are mainly a problem when producers also have a lack of yield. Production costs negatively influence the success of a farm when producers have a low yield, or loss of yield. In such cases, Hypothesis 5 is accepted.

Hypothesis 6: Specialisation into organic production and/or farmgate sales influences the success of the orchard

Leumann (2009) stated that farmgate sales and organic production (both defined in this paper as specialisation) have an influence on economic returns because prices are higher than for IP or ordinary commercialisation. However, yields are lower for both organic production and farmgate sales. An analysis of success factors led Mencarelli Hofmann (2008a) to

conclude that farmgate sales brought advantages. In ISAFRUIT research in Switzerland, apple producers could state if they were satisfied with their production, and an important difference was found between the level of satisfaction by IP and organic apple producers. Only 55% of IP producers were satisfied with their own apple production, but 90% of organic apple producers were satisfied with their production. In an ISAFRUIT comparison between organic and IP orchards, there was a significant difference in gross margins (Bravin *et al.*, 2008). The gross margin for organic producers was higher than the gross margin for IP farmers. Thus Hypothesis 6, that specialisation in organic production and/or farmgate sales influences the success of an orchard, is true; but it should be put into perspective. If producers could achieve higher prices for organic and/or directly sold apples, then Hypothesis 6 is accepted. The success of farmers using farmgate sales, and the satisfaction of organic farmers where both do to higher product prices. If the price for organic or directly-sold apples dropped, Hypothesis 6 would be rejected.

CONCLUSIONS

Yield and quality of the apples are important factors for the economic success of an orchard. Both factors are linked, and the challenge for the apple producer is to

improve their technical management, in order to get better yields and high quality apples.

The number of cultivars grown influences the economic success of an orchard. Each additional variety can have a negative influence on yield. Therefore, farmers should be proficient in the technical know-how for new cultivars, and each cultivar should have a strong selling potential on the market.

Orchard size and production costs have less influence on the economic success of an orchard. Above a certain orchard size, management competence has a greater impact on economic success than any additional orchard area. Production costs have a negative influence on economic success when combined with poor yield.

Specialisation into organic production and/or farmgate sales have a positive influence on the economic success of an orchard. This positive influence is due to higher product prices.

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