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**An Investigation of the Loss in Value Attributable
to Bruising for the Postharvest Handling System of
Apples**

A thesis presented in partial fulfilment of the requirements for the degree
of Master of Applied Science
in Agricultural Systems and Management
at Massey University

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ABSTRACT

Bruising has been identified as one of the major sources of harvest and postharvest fruit damage in New Zealand operations. Using Porter's (1985) value system as a framework, a model was developed to investigate the value of apples lost due to bruising from harvest to ship-side, in the Hawkes Bay District. The cost of bruising was identified using the model for the apple varieties Braeburn, Fuji, Granny Smith, Pacific Rose™, and for both large and small packhouse based operations.

The initial problem statement was developed by applying the "rich" pictures approach which is part of Checkland's (1975) soft systems methodology. To achieve the research objectives, two case studies based on three orchards and two packhouses were investigated to model the value system for apples. The first case study involved two large orchards supplying a large commercial packhouse that packed more than 350,000 TCEs per season. The second study involved a small orchard, that supplied its own on-orchard packhouse, which packed less than 100,000 TCEs per season. Two value systems were developed for the fruit handling systems of the two case studies.

An important factor in calculating the value of fruit on the orchard was the inclusion of an allowance for the grower's return on equity. The value system began once the on-orchard costs of producing apples, including operating costs, fixed costs and return on equity (set at 20%), were covered. Once the initial value of fruit had been established, commercial rates for picking, trucking, and other steps in the processing and distribution chain, were used to establish the value system. This approach enabled the losses attributable to bruising to be costed. Losses increased through the system steadily and were greatest at the market end of the value system than on the orchard. Losses due to bruising, up until and including packing, were found to be much higher for the grower than for any other participant in the value system. This was because the grower forfeited export earnings, as well as paying the direct costs of producing and handling reject fruit. For the Braeburn, Fuji, and Pacific Rose™, varieties the total cost of 1% bruising was equivalent to approximately a 3% loss in export earnings. The loss in value attributable to bruising for Pacific Rose™ was more variable due to limited amount of data available collected. The total cost for 1% bruising of the most bruise susceptible variety, Granny Smith, was estimated to exceed 4% of export earnings.

The total loss to the growers of the apple industry needs to be minimised to ensure the growth of the industry. Since the growers are suffering high losses of returns and small, if any, return on equity due to fruit bruising, it is unlikely that the growers can afford to invest in strategies that can reduce bruising. If new strategies are to be implemented, the returns need to surpass the investment made.

Keywords: Value system, Porter process, bruising, fruit value.
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