

HARVMARK: An Interactive Computer Model for Apple Harvesting and Marketing Strategies

C.G. Embree

Agriculture Canada Research Station, Kentville, N. S. B4N 1J5 Canada

B.W. MacLean

Dalhousie University, Halifax, N. S. B3H 4J1 Canada

R.J. O'Regan

Agriculture Canada Development Branch, Truro, N. S. B2N 5E5 Canada

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Decisions made at harvest time as to whether to manage particular blocks and cultivars for the fresh, peeled, or juice market can dramatically influence net revenue from apple orchards. Factors to be taken into account include anticipated prices and payment dates, yield, quality, losses in storage, and harvesting and marketing costs. Many of these factors can change during the harvest period. In the last few years, new software to assist decision making for managers of horticultural crops has begun to emerge (Creasy, 1986; Hall et al. 1987, 1989; Smith and Arminio, 1986). The need for a quick and sensitive method of predicting the effect of harvest management strategies on the level of profit has led us to develop menu-driven, user-friendly software for personal computers that would assist apple producers with their harvest and market decisions. A prototype was first tested by O'Regan and Embree (1984). The program has been further developed by an interdisciplinary team with horticultural, economic, and computer programming expertise and modified for use on a variety of personal computers using a range of commercial spreadsheet software programs; Visicalc, Multiplan or Excel and Lotus 1-2-3 (release 2.0 or later) for the Apple IIe, Macintosh, and IBM or compatible personal computers, respectively. The program allows comparison of the following harvesting strategies for each block and cultivar: a) fresh market (clean pick); b) fresh market

(spot pick); c) processing (peeled); d) juice.

Horticultural variables taken into account by the program include orchard size, cultivar composition, suitability for fresh or processing markets, apple growth rate, yield for each cultivar, quality for each cultivar, losses in storage, and effects of selective or spot picking on fresh fruit quality. Economic variables include price for the product (which can be calculated by the program based on crop forecasts or entered by the user), payment schedules, interest rates, labor costs for harvest, trucking costs, bin rental charges, storage charges, grade-out quality, packing costs, and capital costs. Factors such as growth rate and yield were derived from previous research in Nova Scotia while factors such as labor costs and quality estimates were based on grower experience.

The manager can test profit sensitivity for a single or a wide range of levels within each variable alone or in various combinations. Information is produced by the program either in tabular form or graphically (Multiplan and

Lotus 1-2-3). For example, Fig. 1 compares the fresh market and juice marketing strategies for various quality levels of 'McIntosh' apples. If the juice price is \$0.10/kg, and expected packout is 80%, then the fresh marketing strategy will yield higher net revenues as long as fresh fruit prices exceed \$0.52/kg. Alternatively, if fresh fruit prices are expected to be \$0.56/kg, then only blocks whose packouts are expected to exceed 60% should be managed for the fresh market.

HARVMARK is a management support system designed to assist management decision making in apple harvesting and subsequent marketing. It contains some of the elements of a relatively new concept called expert systems (Crassweller et al., 1989; Sullivan et al., 1989). HARVMARK is available from the authors on a formatted supplied disk and includes a **user's manual**.

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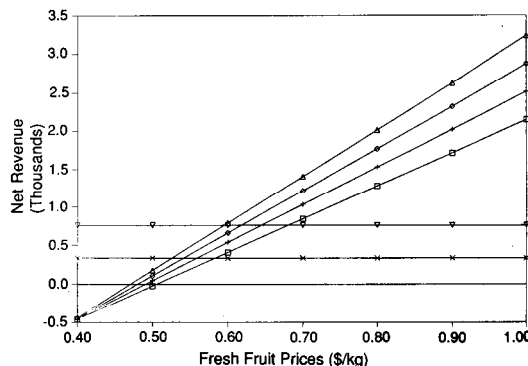


Fig. 1. Net revenue (\$ Canadian) for a 1-ha block of 'McIntosh' with a yield of 20 t·ha⁻¹ as a function of fresh fruit prices, assuming trees are clean-picked and fancy grade packouts are 50% (□), 60% (+), 70% (◇), or 80% (Δ), or block is harvested for juice and juice prices are \$0.10/kg (x) or \$0.15/kg (▽). Expenses were typical Nova Scotia costs for 1989.

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