Table 1. Average annual effects of alternative marketing policies on tomato industry participants

Participant and criterion	Supplies restricted			
	Fla. only[a]		Fla. and Mex.[b]	
	100[c]	75[c]	100[c]	75[c]
	(percent of base situation)			
Florida growers: Net returns	150	139	179	137
Florida handlers: Volume shipped	91	97	100	100
Import handler: Volume shipped	108	102	95	97
Consumers: Expenditures	116	103	107	101

[a]Experiment I

[b]Experiment II

[c]Percent of parity price

Florida handlers preferred either the base situation with no regulations or Experiment II. Import handlers were benefited most by experiment I-100.

Concluding Remarks

The analysis presented in this article illustrates the potential of using an econometric simulation model to evaluate alternative courses of supply management action available to highly perishable product industries. A great deal of data are required to develop a dynamic model that can simulate the interseasonal effects of alternative actions as well as the intraseasonal effects. This first generation model of the fresh winter tomato subsector supports the view that the long-run consequences of short-run policies and programs can be investigated effectively with simulation techniques.

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MECHANICAL REMOVAL OF TOMATOES WITH A VERTICAL SNAPPING MOTION

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Abstract. **A vertical snapping motion produced by a double crank mechanism has been evaluated for possible incorporation into a once-over mechanical tomato harvester. A plant basket with a lattice bottom is jerked upward with the mechanism causing separation of fruit from the plant foliage. The maximum upward acceleration is twice the downward acceleration so the plant foliage can be held in the basket with minimum restraint. The effectiveness of fruit removal and fruit-stem separation for two levels of upward acceleration are reported. A proposed fruit separation mechanism for a harvester utilizing this type of shaker is discussed.**

The problem of fruit-vine separation continues to be a major obstacle in the development of a satisfactory fresh market tomato harvester for Florida growers. Both the IFAS experimental tomato harvester and the Button-Johnson processing tomato harvester (1) have fruit-vine separation mechanisms that use a horizontal shaking action to cause inertial removal of the fruit from the vines. The shaking action on these machines is parallel to the direction the vines are conveyed through the machine. The fresh market tomato harvester developed at Clemson University (4) utilizes a shake mode that is parallel to the direction of vine travel as well as a vertical shake mode to accomplish fruit separation. Both the frequency and the amplitude of the vertical and horizontal shaking motions can be independently adjusted on this harvester. Hayslip and Deen (3) developed a semi-mechanical fresh market tomato harvester for Florida conditions. On this machine fruit-ladened plants are manually shaken in a vertical direction to remove the tomatoes. The

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most effective manual shake has been found to be an upward jerk or snap which in effect is an upward acceleration.

A mechanism capable of developing a periodic upward acceleration that is twice as great as the downward rate is shown in Fig. 1 and has been incorporated into a vertical shaker for studies of pepper and tomato harvester concepts (2) (Fig. 2). A plot of the acceleration with time of a point on the basket is shown in Fig. 3. A high unidirectional upward acceleration is desired because the direction of the fruit pulled loose tends to be down and away from the shaker. This paper reports the results of a test to determine the effectiveness of this shaker in detaching fresh market tomatoes.

Materials and Methods

A preliminary test with the vertical shaker in early spring of 1975 indicated that the depth of the shaker basket should be doubled to 16 in. from that used for the pepper experiments to allow more room for the tomato plant foliage. The interior length and width of the basket were left unchanged at 36 in. each. The spacing of the 0.625 in. diameter round bars in the lattice bottom were set at 6 in. on center giving effective square openings of 5.375 x 5.375 in. No padding material was provided on the lattice bars but 0.25 in. plastic foam padding was secured to the underside of the basket superstructure to protect the fruit from sharp edges.

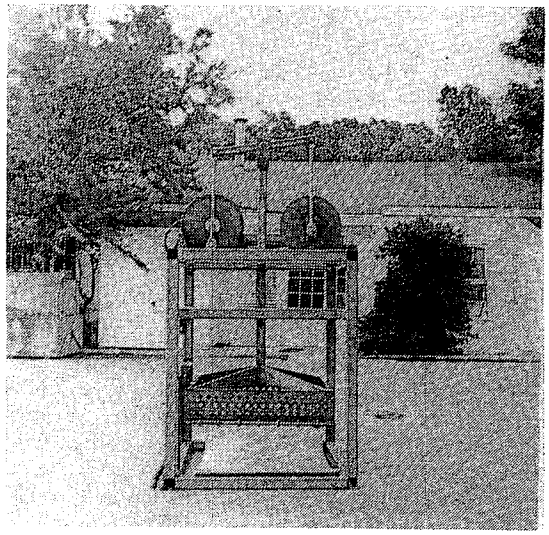

Fig. 2. Vertical shaker for harvester concept studies.

The shaker is driven with a hydrostatic motor with an adjustable flow controller provided to vary the shaker frequency. The hydraulic system of a farm tractor provides the hydraulic power. From the preliminary tests it was decided to determine the effectiveness of fruit removal with two different levels of vertical acceleration. The tractor used could provide sufficient hydraulic power to drive the slower crank at 300 rpm resulting in 300 shaker strokes per minute. With this crank speed, the machine can develop upward accelerations of 3.8 and 5.1 g's with strokes of 6 and 8 in. re-

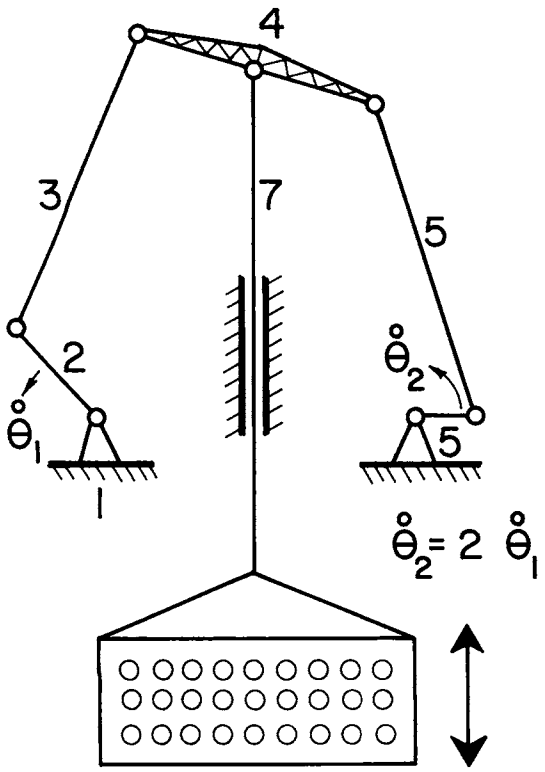

Fig. 1. Seven bar mechanism for vertical shaker.

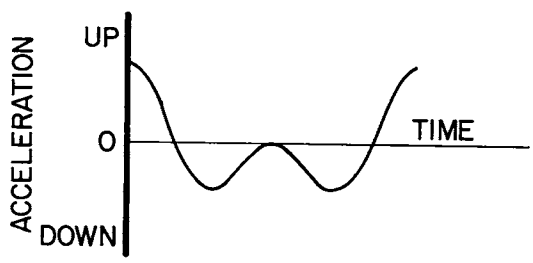

Fig. 3. Acceleration of basket on vertical shaker.

spectively. These two levels of upward acceleration were selected for this series of tests. From the results of the preliminary tests it was decided to determine the effectiveness of fruit removal for shake durations of 5, 10 and 15 sec.

The tomato plants used in this machine evaluation were grown at the University of Florida Agricultural Research Center at Immokalee and were the Florida MH-1 variety. The plants were cut just below the ground line and the elapsed time until shaking was approximately 60 minutes.

Results and Discussion

The effect of shaking time and acceleration on fruit-vine separation of Florida MH-1 tomatoes are shown in Table 1 and 2 for single plants and four plants together respectively. In Table 1 the separation for each shake duration and magnitude of acceleration is an average of four plants tested individually. Table 2 shows the degree of separation with one test of four plants together in the basket shaken for 10 seconds. Excess crowding of the plants in the basket is the probable cause of the much lower degree of separation shown in Table 2. It appears from Table 1 that a shake duration 5 to 10 seconds is required for effective removal depending on the magnitude of the acceleration.

Table 3 shows the effect of shaking time and acceleration on fruit-stem separation of Florida MH-1 tomatoes. It appears that increasing the magnitude of the acceleration causes a higher percentage of the fruit to be free of stems but there is no significant increase in stems with shake duration. This indicates that the fruit separation is due to tensile failure at the stem-fruit juncture and not due to fatigue failure of the stems as appears to be the case with green bell peppers (2).

Observations were made on the amount of cut or puncture and bruise damage and it was found to be excessive. There appeared to be no increase in damage with an increase in acceleration. There is no reason to believe that this type of shaker should cause more fruit damage than those presently used in tomato harvesters and no doubt the damage could have been reduced if more padding had been applied to the basket.

Conclusions

This vertical shaker mechanism has demonstrated that it can effectively remove tomatoes from vines in 5 to 10 seconds. On a tomato harvesting machine traveling at ½ to 1 mph, this shaking time would require a shaker bed length of from 3.66 ft. to 14.66 ft. It is apparent that a shaker bed in this size range could be fitted on a harvester chassis and result in a machine that would be reasonably maneuverable.

Table 1. Effect of shaking time and acceleration on fruit-vine separation of Florida MH-1 tomatoes.

Shaking time (sec)	Acceleration (g's) 3.8	5.1
	% Separation	
5	90	96
10	97	99
15	100	100

Shaking time significant @ 1% level
Acceleration significant @ 5% level

Table 2. Effect of acceleration on fruit-vine separation with 4 plants of Florida MH-1 tomatoes in shaker basket.

Acceleration (g's)	Replication 1	2	3	Mean
	% Separation			
3.8	90	89	77	85
5.1	94	97	97	96

Shaking time 10 sec.

Table 3. Effect of shaking time and acceleration on fruit-stem separation of Florida MH-1 tomatoes.

Shaking time (sec)	Acceleration (g's) 3.8	5.1
	% Stems	
5	13	6
10	10	7
15	13	8

Acceleration significant @ 1% level
Shaking time not significant

Some configuration of the jerk shaker concept could very easily be incorporated into the two dimensional type shaker mechanism used on the Clemson type tomato harvester and this is planned for future studies.

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WEATHER AND DISEASE SURVEILLANCE IN SOUTHWEST FLORIDA[1]

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Abstract. **Associations were made between the weather parameters temperature and rainfall and disease occurrence during the first two years of a weather and disease surveillance program at the Agricultural Research Center in Immokalee, Florida. Additional comparisons were made between 10-year records of disease occurrence and between the 2-year and the 10-year disease records to establish the periodicity of disease occurrence and associations with weather parameters. In the 2-year records it was possible to determine a consistent association between the cessation of Botrytis blight of peppers (Botrytis cinerea) and temperatures below 58°F. In further comparisons, the sensitivity of Botrytis blight to low temperatures remained consistent throughout the 10-year records. An association was found between low rainfall and downy mildew (Pseudoperonospora cubensis) of watermelons. Low rainfall arrested the development of the disease under favorable temperatures..**

The constant surveillance and recording of plant diseases on most agricultural crops in the United States has not been done on an organized basis as it has been done in Europe and in some of the former colonies of European countries.

While there have been numerous surveys of diseases on specific crops, they have been of a somewhat temporary nature. Once the specific goal of the project had been reached, the survey was generally discontinued.

Regulatory agencies of the individual states and of the U.S. government do have continuous records of diseases intercepted in travel between states or between countries. These records do not usually contain enough information to determine the incidence, severity, or termination of a particular disease as do the records kept in Europe.

Most agencies in Florida, whether state, federal, or university, have not been too concerned with disease surveillance on the principal crops.

During the 1940's through the 1960's, while abundant new and more effective fungicides were being produced, agricultural interests were less concerned with the efficient cost-accounting of fungicide applications.

More recently in the 70's, costs of agricultural production have increased tremendously, while labor and pesticide costs have not lagged far behind. In addition, new pesticide regulations were instituted, restricting widespread pesticide usage. The relatively recent recognition that energy sources were limited and not infinite has spurred the agricultural community to seek other alternatives to the old practices of unregulated spraying such as those reported previously (1, 3, 6). Disease surveillance and recording at the Agricultural Research Center in Immokalee from 1966 to 1972 was limited to identifying causal organisms and describing the crop and its general location.

[1]Florida Agricultural Experiment Stations Journal Series No. 7093. Grateful acknowledgement is hereby made to Mr. L. L. Benson, Chief Meteorologist, National Weather Service, Page Field, Fort Myers, Fla., for his consistent efforts in maintaining and repairing the weather instruments used in the experiment and his continuous guidance in meteorological matters. Partial financial support from the Center for Environmental Programs, IFAS, University of Florida is hereby acknowledged.