Apricot Harvest Predictable

method of reliable forecast five to ten weeks before harvest an aid in merchandising fruit at right time

Reid M. Brooks

The harvesting date of Blenheim or Royal apricots in Contra Costa County has been predicted within two days 50% of the time, and within four days every season in a 17-year experiment at Brentwood. In two years the predicted and actual harvest date were the same.

Predictions were made six weeks after full bloom of the apricots. Since the fruits take some 11 to 16 weeks to develop from full bloom to maturity in the various districts of California, the forecasts are available five to 10 weeks before actual harvesting. This gives the grower time to lay his plans for the obtaining of labor, the preparation of his land for the harvest, and other matters.

The prediction method achieved these satisfactory results despite the fact that no consideration was given to such factors as the economic market situation in the eastern United States which might influence harvest time in California; the labor situation which might induce the grower to harvest one or several days earlier if he has a crew available; the size of crop which might influence time of maturity; and judgment of the man who decides the date of full bloom year after year.

During the period of the study the shortest time lapse between full bloom and harvest time was 89 days—in 1934—and the longest 112 days in 1935—a difference of 23 days. Obviously the mean of such a lengthy period is unsuited for accurate determination of the harvest date.

On the calendar basis, the earliest time that Blenheims were picked at Brentwood was May 25—in 1934—the latest time was June 23—in 1948. Thus in calendar dates, there was a spread of 31 days between the earliest and latest dates the same variety was harvested from the same orchard. Again, a calendar date can not be used for stating, say, in April of a current year, that harvest time will begin on a specific date.

Necessary Data

The availability of four factors is essential for predicting harvest dates:

1. The date of full bloom and the date of the beginning of harvest must be known for as many years as possible; ten years is perhaps the minimum number of years and it is better to have 15 or more years' records.

2. Temperature records must be available over the same period of years. The records should be obtained from an instrument as near the orchard under observation as possible. If such records are not available, then a grower, in order to utilize the method outlined here, would have to interpolate the number of days before or after actual harvest of a known orchard in his district which might be considered standard. Satisfactory data have been received from a continuous recording thermograph.

3. All data will have to be concerned with the same fruit variety throughout the entire period under observation. Results based on several varieties of the same species give inconsistent predictions.

4. Mathematical formulae, suitable for correlating the seasonal temperatures with date of harvest and for predicting this date, are necessary.

Predictions, if to be of great use and value, must be made as soon as possible after full bloom time.

For the purpose of this study a heat unit is defined as 1° F per day above a given base temperature of 45° F.

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Formulae in Use

The first formula used in the harvest prediction method—

$$r = \frac{\Sigma\, x y}{\sqrt{\Sigma\, x^2\, \Sigma\, y^2}},$$

computes r—the correlation of accumulated heat units, using a 45° F base line, for the first six weeks after full bloom with the days between full bloom and harvest. The x is the deviation of the heat units for each year from the average of all years under consideration. The y is the deviation of the number of days between bloom and harvest from the average.

Example, using data from the table on the left:

$$\frac{-9{,}840.76}{\sqrt{117{,}344{,}385.6576}} = -0.908.$$

The result indicates excellent correlation, and therefore excellent possibilities for correct prediction.

In the second formula,

$$\Sigma = \bar{y} + \frac{\Sigma\, x y}{\Sigma\, x^2}\,(X - \bar{x}),$$

Σ is the predicted number of days between full bloom and harvesting time; $\bar{y}$ is the average for the number of days between full bloom and harvest for all of the years' data under consideration. X is the number of heat units for the first six weeks of the current year. $\bar{x}$ is the average of the number of heat units for the first six weeks after full bloom.

Example, using data from both tables, left and right, in forecasting harvest time for 1950:

$$100.4 + \frac{-9{,}840.76}{163{,}943.76}(418\text{–}461.6) = 103.017.$$

Correlation of Heat Units for the First Six Weeks after Full Bloom—H—with the Number of Days between Full Bloom and Harvest Date—D—for Blenheim or Royal Apricots, Brentwood, 1934–1949.

Year	H	D	x	y
1934	689	89	+227.4	—11.4
35	353	112	—108.6	+11.6
36	484	103	+ 22.4	+ 2.6
37	406	104	— 55.6	+ 3.6
38	375	102	— 86.6	+ 1.6
39	572	92	+110.4	— 8.4
1940	478	96	+ 16.4	— 4.4
41	525	94	+ 63.4	— 6.4
42	384	108	— 77.6	+ 7.6
43	546	98	+ 84.4	— 2.4
44	488	100	+ 26.4	— 0.4
45	320	110	—141.6	+ 9.6
46	439	99	— 22.6	— 1.4
47	450	97	— 11.6	— 3.4
48	302	109	—159.6	+ 8.6
49	575	93	+113.4	— 7.4
Sum	7386	1606		
Average	461.6	100.4		
	Σx^2		Σy^2	Σxy
	163,943.76		715.76	—9,840.76

Observed and Predicted Harvest Dates for Blenheim or Royal Apricots, Brentwood, 1934–1950.

Year	Heat units for first six weeks	Harvest time: Observed	Harvest time: Predicted	Harvest time: Deviation
1934	689	89	87	—2
35	353	112	108	—4
36	484	103	100	—3
37	406	104	104	0
38	375	102	106	+4
39	572	92	94	+2
1940	478	96	100	+4
41	525	94	97	+3
42	384	108	106	—2
43	546	98	96	—2
44	488	100	99	—1
45	320	110	110	0
46	439	99	103	+4
47	450	97	101	+4
48	302	109	110	+1
49	575	93	94	+1
1950	418	102	103	+1

WALNUT

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The dry ingredients should be slurried, and added to the spray tank—with agitator going—when the tank is one third to one half filled with water. The oil should be added when the tank is three fourths or more full. This treatment does not appear to cause an increase in orchard mites over that which occurs where no DDT is used.

In areas where the codling moth has not presented a serious problem, the DDT wettable powder can be omitted from the spray. A single, thorough application of the spray mixture should result in adequate control of the codling moth, if applied before the first brood of larvae begins to enter the developing walnuts. This is just before, or about the time, the average diameter of the nuts reaches one half inch, and in the Linden area this is usually about the first week in May.

The aphicide to use in combination with the codling moth spray applied by a conventional sprayer would be one of the following: 2⅔ ounces of 25% parathion; one half pound of 25% lindane; one pound of benzene hexachloride containing 6% gamma isomer; one pound of 14% nicotine dry concentrate; or ⅛ pint of 40% tetraethyl pyrophosphate in 100 gallons of water.

Under no conditions should benzene hexachloride be applied later than in the early codling moth spray and then never at higher rates than the above amount. There is some danger of off-flavor to the nuts.

When application is made by air carrier sprayer satisfactory results in codling moth control may be obtained with 50% DDT wettable powder at the rate of two pounds per 100 gallons of spray.

Regardless of the number of trees per acre, the dosage—in terms of the amount of 50% wettable DDT powder—should be 7½–8 pounds per acre.

Although 1950 investigations showed that a liquid depositor could be substituted for the oil and dry DDT depositor, the later is recommended pending further studies with the liquid depositor. It appears that the following mixture is the best to use for codling moth and aphid based upon investigations to the present time:

50% DDT wettable powder	**10 pounds**
DDT depositor	**3 pounds**
14% nicotine dry concentrate	**9 pounds**
or	
25% wettable parathion	**1¼ pounds**
or	
Benzene hexachloride (6% gamma isomer)	**9 pounds**
Light medium summer oil emulsion	**3 gallons**
Water	**500 gallons**

To insure the proper rate of application, the optimum number and kind of nozzles and the rate of speed to travel for the spray rig in use, should be known.

Where these concentrations are used approximately 400 gallons of dilute spray should be applied per acre.

To gain satisfactory aphid control with such insecticides as parathion and tetraethyl pyrophosphate, it is necessary to obtain exceptionally good kills. This means that the aphid population should be reduced to such a low level that it is nearly impossible to find any live individuals following treatment. Insecticides also destroy the natural enemies of the aphids, and if many aphids escape treatment they will soon increase to a destructive level.

To avoid any possibility of aiding in the selection of a resistant strain of aphid it will probably be a desirable practice to alternate two different insecticides in the aphid control program. For example, parathion might be used in one treatment and nicotine dry concentrate in the next.

Insecticides used for the control of walnut insects are poisonous, and care should be taken in handling and applying them. Particular caution should be used with parathion, and tetraethyl pyrophosphate. Precautions as given by the manufacturer should be observed.

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ECONOMICS

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of orange and lemon demand, of almonds, of canned cling peaches, canned asparagus, canned apricots, and canned pears are being used in this way.

Various statistical data are compiled which are necessary to chart trends in production, shipments, uses, and prices of many commercial crops produced in California.

A comprehensive set of index numbers on major aspects of the state's agriculture is being kept up to date. These index numbers measure—for the state as a whole—changes in production, shipment, and prices of major commodity groups.

Another example of the compilations necessary, are the statistics on temperatures and related factors being compiled in connection with a study on the development of frost insurance for crops such as citrus.

The current situation and outlook for many agricultural commodities are evaluated. Examples include commodity studies on apples, asparagus, avocados, dried beans, eggs, grapes, lettuce, milk and milk products, olives, peaches, pears, plums, tomatoes, walnuts, sheep and wool.

Situation and outlook bulletins on lemons and oranges are in preparation. Also a detailed economic analysis is being made of the complicated interrelations existing among the grape industries including wine, raisins, and fresh shipping grapes.

To evaluate the situation and outlook for a crop, it is necessary to have an adequate picture of the national situation, and even the international situation for some crops. Trends in items such as national income, industrial production, employment, and the general price level must be recognized.

National agricultural policy on production, price supports, and marketing agreements affects California agriculture. The state also has its own legislation on marketing agreements and orders. These types of governmental influences are major aspects of some of the agricultural industries in this state.

Adequate emphasis on these—and other—factors is a necessary part of the research by the Division of Agricultural Economics to provide useful information for the state's agricultural industries.

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PREDICTION

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Six weeks after full bloom the heat units for that period are calculated, placed in the formula, and the prediction made.

Two mathematical formulae are used. The first determines how close the relationship of heat accumulated for the first six weeks after full bloom is to the period between full bloom and harvest time. If a high correlation exists, it may be assumed that the prediction of harvest time halfway through the season may be good to excellent.

The second formula predicts the number of days between full bloom and harvest time. In calculating the harvest time of Blenheim apricots at Brentwood in 1950 the computation gave a figure of 103 for the predicted number of days between full bloom and harvest. Since full bloom occurred February 27, harvest was predicted for June 9. Actual harvest began June 8.

The method has been applied to similar data for Bartlett pears and French prunes with good results.

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