Comments on "The Utility of Weather Forecasts to the Raisin Industry"

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25 April 1962

In the conclusion to their paper "The Utility of Weather Forecasts to the Raisin Industry" (March, 1962) Messrs. Kolb and Rapp state: "We would like to point out, from our experience in studying the raisin-drying industry, several essentials of any study of the application of weather information to the needs of a specific industry. Firstly, it is necessary for the meteorologist to understand the effect of the weather on the operation. . . . Next it is important to have the weather information in a form consistent with the problem at hand. . . . Last, an estimate of the economic factors must be available if the weather information is to be utilized to minimize cost." These criteria seem well chosen and a natural outline with which to examine their paper.

On the question of their technical understanding of the effect of the weather on raisin production, they say: "(Section 2) When rain threatens, the producer rolls the paper trays and leaves them stacked in the rows in the vineyards." They must have misinterpreted the information given to them by their advisor, Mr. Curtis Lynn, for in a letter of 12 July 1960, Mr. Lynn wrote: "(In the rains of 1957 and 1958) Very few of the drying grapes were protected from rain. Rolling is the only successful method of protection at the present time and it is necessary that the grapes be quite dry before they can be rolled. I would estimate that it is necessary that the grapes be approximately 75 per cent dry or it is physically impossible to roll the trays." Subsequent discussion with Professor A. J. Winkler of the University of California at Davis and other experts confirmed the fact that the trays can not be rolled until the grapes are dry enough so that they could have been rolled as part of the curing process.

The misinterpretation is easier to understand when it is realized that an earlier paper on the same area by Jorgensen ("An Objective Method of Forecasting Rain in Central California During the Raisin Drying Season," *Mon. Wea. Rev.*, 77, 31-46) was based on the same assumption. However, at the time Jorgensen's paper was written, the prevalence of wooden trays allowed protection at low cost. The post-war change to paper trays rules out the chance of protecting the drying grapes. Since this technical "fact" formed the basis of the analysis, the conclusions are negated.

The authors are not entirely consistent as to the best form of the weather information for the problem. In Section 2 they are of the opinion that the weather changes significantly over the drying period: "Ordinarily, excellent drying conditions prevail until the middle of September. Thereafter, the season becomes more critical as the days become shorter, the temperatures drop, and the probability of damaging rain increases." While in Section 3 they change to: "From Jorgensen's paper, the probability of rain is 0.0222 for each day of the period from September 1st through October 20th." They go on to base all of their calculations on this constant probability of rain in contradiction to the earlier statement and in greater contradiction to the climatology. It is difficult to understand how they justify using a constant probability of rain when Jorgensen gives a table for the occurrence of rain for five day intervals over the drying period; the table runs from 0.0000 for 6-10 September to 0.24 for 16-20 October.

Finally, the economic issue is a complicated one not deeply treated in the paper. "(Section 3) We have shown that a careful analysis of the weather data is essential to the correct solution of the problem, even though we may have overlooked some of the nuances of the economics." The problem is difficult and what may appear at first glance to be a nuance, need not eventually turn out to be one. Kolb and Rapp have argued that better forecasts increase the production of raisins, the obvious corollary being that this increase is good for the grower. But there is fallacy of composition here and it is not necessarily true that what is good for a grower is good for the industry. In fact I have shown in a forthcoming paper¹ that the net effect of better weather information is negative for the raisin industry, at least in the short run. This can be seen since price falls as the quantity of raisins offered for sale increases. Revenue, the product of rising quantity and falling price, may either rise or fall. Econometric investigation of the raisin industry indicated that, as quantity rises, revenue falls (demand is inelastic), and, *a fortiori*, that industry profits fall.

¹ Lave, Lester B., 1963: Investigation of the value of better weather information to the raisin industry. *Econometrica*, 3, to be published in January.