Robert Phillips
Prog. No. 77-P4

Project Title: Environmental Variables and Crop Protection

ANNUAL REPORT 1977

1. Objectives The objective of the research is to correlate environmental variables with crop production and develop a method of preparing an early, accurate forecast.

2. Interpretive Summary Results have been very good. The early forecasts are more accurate than the early forecasts made by the State; the final 1977 forecast is within one percent of the crop.

3. Experimental Procedure Environmental conditions are monitored throughout the year. Precipitation and temperature are most important, although humidity can be important at bloom. Solar radiation is important in spring. Total cooling must be watched and of course low temperatures can be disastrous after bloom. The 1978 season will be interesting as there was more tree stress in 1977 than in any recent year. Late spring-early summer temperatures are critical and are a major object of study.

Results

ALMOND FORECASTS

Phillips		California Crop and Livestock Reporting Service	
March 2, 1974	221,350,000	May 10, 1974	205,000,000
April 30	213,850,000	June 10	205,000,000
June 23	216,500,000	July 10	220,000,000
	1974 Final Crop: 230,000,000 pounds		
April 30, 1975	170,000,000	May 10, 1975	170,000,000
June 25	173,000,000	June 10	170,000,000
		July 10	165,000,000
	1975 Final Crop: 185,000,000 pounds		
April 30, 1976	257,500,000	May 10, 1976	255,000,000
June 25	257,500,000	July 10	280,000,000
	1976 Final Crop: 287,000,000 pounds		
April 30, 1977	305,000,000	May 10, 1977	295,000,000
June 29	315,000,000	July 10	310,000,000

Discussion The research on crop yields has gone beyond the "promising" stage. All of the early forecasts have been relatively good and only the late one in 1976 was in serious error. The influence of late spring and summer temperatures on the crop is the area most needing work and this is now my focus of study.

Publications Since last year: "The Value of Accurate Long Range Crop Forecasts". To be presented in Ibadan in April and published by the Association for the Advancement of Agricultural Science in Africa.

January 1978

Environmental Variables and Crop Production

Robert Phillips December 6, 1977

Objectives To correlate environmental variables with crop production and develop a method of preparing an early, accurate forecast.

Progress Considerable progress has been made during the past year. Work on the effects of low precipitation has continued; it has become clear that the total amount of rainfall is not the important factor. The 1977 year was one in which temperatures were important in plant growth. A great deal of headway was made in understanding some of these plant-temperature relationships.

To Do More work needs to be done on some aspects of tree response to temperature. Conditions leading to the formulation of the June forecast need particular attention.

Conclusion I am encouraged by the accuracy of the 1977 forecasts. The system was able to respond to the dry winter and the unusual temperatures of February-March-April-May. It appears that the early forecast will be within three percent of the total crop and the June forecast within about one percent.

THE 1977 CROP YEAR AND FORECASTS

Preparation for the 1977 forecast began in the late summer of 1976.

Late Summer and Fall Foremost in everyone's mind at that time was the drought and the possibility that it might continue. The months of August and September were cooler than normal in the Central Valley, minimizing stress damage to very young buds. October was warmer than normal, however, which could harm trees not under irrigation.

Winter November and December continued dry and warmer than normal; January turned cool, however. Altogether, cooling was adequate.

Early Spring February was warm and generally dry with plentiful sunshine; March was cool and overcast. During bloom there was good pollinating weather on a few hours of a few days for each variety. It is likely that the cool March was helpful to the crop.

Late Spring April was very warm. The forecast prepared at the end of April was for 305 million pounds. At the time this was considered to be much too high but the Crop Reporting Service followed in May with a forecast of 295 million pounds.

May was the coolest in recent history and very wet. The cooler weather allowed greater storage of photosynthate, that is, during cool weather and lower rates of respiration more of the products of photosynthesis remain with the plant. June was quite warm. The May temperatures caused me to increase the June forecast to 315 million pounds. In July the Crop Reporting Service increased their forecast to 310 million pounds.

The Summer Conditions were within the normal range and had little effect on the crop. It is possible the high temperatures at the very end of July caused some minimal diminution to the crop.

Evaluation The forecasts seem to have been accurate. The early forecast seemed to respond well to the spring weather and point to a crop larger than anyone was then anticipating. May conditions dictated an even higher forecast. It appears that the early forecast will be in error by three percent and the June forecast by one percent.

Conclusion It seems clear that environmental variables can be used to prepare an early, accurate forecast of the almond crop. All of the early forecasts (1974-75-76-77) have been more accurate than those of the Crop Reporting Service or any others that have come to my attention. The late forecast in 1976 was short by several million pounds, however, and it remains to be seen whether the problems leading to that error have been overcome.

ROBERT PHILLIPS

December 6, 1977