decline further. Job opportunities for students of agriculture will probably increase as other parts of California's economy such as the defense industry suffer setbacks.

Summary and conclusions

An in-depth examination of student enrollment in California's seven four-year agricultural schools shows that agricultural production areas lost majors in each subfield. An exception was animal science at one state university, where it remained about the same. Enrollment trends between the CSU and UC systems in these areas are strikingly similar.

Fields related to agriculture showed mixed retention of students. Some—agricultural engineering, agricultural economics, and nutrition and food science—expanded, while general agriculture lost students. There was considerable variation in enrollment trends in these areas between the two systems.

Supporting fields of study and other subject areas also showed mixed results. Forestry suffered a dramatic loss of students. Sciences like molecular biology and genetics attracted students.

The negative image of agriculture is generally accepted by agricultural college deans as a major contributor to the loss of interest by students in agriculture.

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Heat stress and copper supplementation in pigs

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Controlled feeding trials at UC Davis found no connection between temperature stress and response to copper supplementation, but confirmed overall effects of heat stress on pigs.

Over 30 years ago, a researcher in Great Britain discovered that adding copper sulfate to the ration of growing-finishing pigs improved their performance. This response has been confirmed by many others, and copper supplementation is common in many countries. However, as is usual in most instances with feed additives, not everyone gets the same results. Some producers have suggested that the higher temperatures found in parts of California where hogs are commonly raised cause the lack of response.

Feeding study

We have completed five replicates of a study over five farrowing seasons at UC Davis. We used 80 pigs and added 0.1 pound copper sulfate per 100 pounds of ration (255 ppm copper) to a balanced experimental ration based on corn, soybean meal, 50% meat and bone scraps, dicalcium phosphate, limestone, and a vitamin-mineral premix (added 12.3 ppm copper to rations). Two similar temperature-controlled chambers were used for housing; pigs were kept in individual stalls, eight per chamber. One chamber was a control in which temperature was maintained at 73°F, considered ideal for growth and based on prior research; the other was maintained at 91°F. Pigs were fed once a day all the feed they would readily consume, with water available at all times. Respiration was counted for each pig daily in the first four replicates.

The study was designed as a 2 x 2 x 2 x 5 factorial, with two breeds (purebred Durocs and three-way rotational crossbreds), two ambient temperatures (control and high temperature stress), two levels of added copper (0 and 250 ppm), and five replicates. Littermate pairs of pigs were placed on the same copper intake, one in each chamber. Numbers of each sex and each breed were also balanced. Pigs initially averaged 70 pounds (32 kg) and were fed for an average of 66 days. The ration, which was sampled and analyzed regularly, averaged 16% crude protein and either 17 or 279 ppm copper.

Results and conclusions

The only statistically significant differences due to copper supplementation were in feed efficiency and daily gain (table 1). There was no interaction between air temperature and copper supplementation in effects on gain, feed consumption, or feed per unit of gain. We conclude that temperature stress under the conditions of this study had no effect on the response to copper supplementation.

The effects of temperature on gain and feed consumption confirm results previously reported at Davis: The increase in respiratory count indicates heat stress. The advantages of crossbreeding in commercial hogs are also confirmed with regard to gain, feed consumption, and feed utilization.

TABLE 1. Relationship of temperature and copper supplementation

Item	Avg. daily: Gain	Feed	Feed unit gain	Respiration (breaths/ min.)
	lb	*lb*		
Supplemented copper level, ppm:				
0	1.83 a	4.65	2.63 c	53.7
250	1.91 b	4 61	2.48 d	53.9
Temperature:				
Control	2.03 e	4.98 e	2.53	45.5 e
Heat-stressed	1.71 f	4.28 f	2.58	62.1 f
Breed:				
Duroc	1.77 e	4.45 e	2.61 x	53.8
Crossbred	1.98 f	4.81 f	2.50 y	53.8

Note: Different letters for the same trait in the same column indicate statistically significant difference: a,b = P<0.10; c,d = P<0.005; e,f = P<.001; x,y = P<0.05.

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