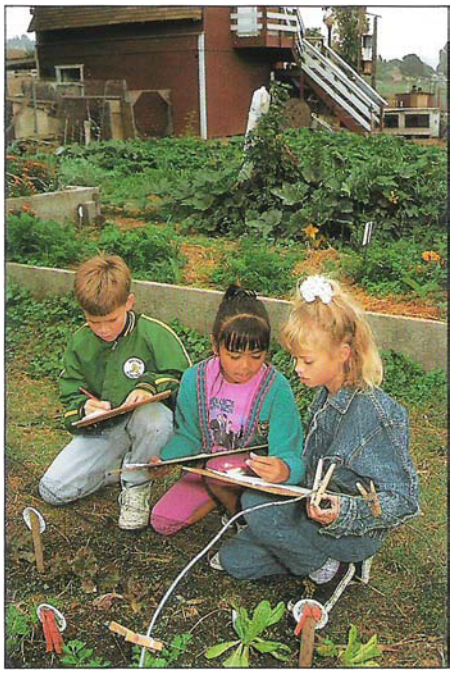
Dan Desmond

Recent publications and brochures concerning agricultural literacy and related programs.

Toxics, food safety, water quality "most important"...

How California educators and CE directors view "agricultural literacy" programs

Marc T. Braverman ❑ Ellen L. Rilla



Jack Kelly Clark

Students at Loma Vista Farm measure plant growth.

Agricultural literacy programs — now underway in a few California schools — are designed to provide students with a fundamental understanding of how our agricultural system works, including its relationship to natural resources and the environment. In statewide surveys, public school administrators and CE county directors agreed such programs should be incorporated into science or social studies classes during late elementary and middle grades. District administrators identified the most important topics to be toxics in the environment, toxics in the food supply, and water quality and policy. Groups surveyed expressed differing opinions, however, about the urgency of teaching the topic in schools.

With increasing frequency and urgency, society is called upon to make decisions about critical agriculture-related issues such as food safety, land use, and water policy. In order to make informed decisions, the American public must have a basic understanding of agriculture and its role in our society and economy. Yet several recent reports have concluded that the public's knowledge of agriculture is inadequate. The most prominent of these was a 1988 National Research Council report commissioned by the U.S. Departments of Agriculture and Education, *Understanding Agriculture: New Directions for Education*. As a result, the concept of "agricultural literacy" has been receiving more attention among scientists and policymakers in both California and the nation.

Proponents of agricultural literacy agree that one of the primary avenues for promoting public understanding should be our schools. In clarifying the roles of school programs, the National Research Council drew an important distinction between two sets of educational objectives: Education "in" agriculture refers to pro-

grams that prepare students for agricultural careers. These programs focus on vocational skills and, by design, reach a relatively small percentage of students. In contrast, education "about" agriculture refers to programs that promote agricultural literacy among all students. These programs teach students agricultural information and skills they will need in order to participate as citizens in a democratic society. Content typically includes fundamental principles of food and fiber production, agricultural marketing, nutrition and diet, and other topics.

Nonformal (out-of-school, yet structured) channels for teaching about agriculture have existed for many years, primarily through Cooperative Extension 4-H programs. However, school-based programs are rare, and those that do exist are usually underfunded. One of the most popular school programs is "Ag in the Classroom," instituted several years ago by the U.S. Department of Agriculture. Other programs exist in scattered areas, usually the result of local initiative (see sidebar). Nevertheless, the majority of the nation's children remain unexposed to programs and curriculum materials that address agricultural issues to any significant degree.

Recognition of the need for greater public understanding of agriculture is only the first step in the educational program development process. Broad questions remain about what the actual content and approach of agricultural literacy programs should be. To facilitate this early stage of planning, a UC Cooperative Extension (CE) research team conducted an inquiry into the state of agricultural literacy programs in California. One of our primary aims was to determine the views of administrators across the state on specific issues. Through contacts with educators and CE personnel, we also identified several highly regarded programs now in operation. We conducted site visits to seven of these to study their goals, philosophies, successes and problems.

Survey procedures

Three separate, critical populations were surveyed to determine their views on agricultural literacy education: county superintendents of education, CE county directors, and district superintendents of education. All populations received a two-page questionnaire, with the first two groups receiving an early version (survey 1) and the district superintendents receiving an expanded and revised version (survey 2). Both surveys began by defining agricultural literacy as a "basic understanding of where our country's food and fiber come from." The surveys asked respondents to identify the grade levels in which, in their judgment, agricultural literacy education is most appropriate. Grade levels were grouped into the following blocks: kindergarten to grade 3, grades 4 to 6, grades 7 to 9, and grades 10 to 12. Both surveys also asked for respondents' opinions on which curricular areas are most appropriate for teaching agricultural literacy: social studies, history, language arts, mathematics, science, or as an independent curricular area. These two items, addressing appropriate grade levels and subject areas, permitted multiple responses. The surveys also asked respondents to identify ongoing educational programs in their counties.

The surveys differed in the item that reflected the overall significance of agricultural literacy. Survey 1 asked respondents to judge the importance of teaching agricultural literacy on a seven-point scale from "not important at all" to "extremely important." In the revised survey 2, respondents were asked to rate the priority that should be given to teaching agricultural literacy in schools, on a five-point scale from "very low priority" to "very high priority." This change in item wording was made to address more directly the willingness to devote actual class time to the topic. Survey 2 also included several new sections. To address the potential content of agricultural literacy programs, respondents were asked to rate the individual importance of teaching 11 possible subtopics (see table 3). Finally, survey 2 asked respondents to identify demographic trends in their districts such as population increases, growth of industries, and changing economic bases.

Survey 1 was mailed to all county public school superintendents and all UC Cooperative Extension (CE) county directors in May 1989. Follow-up telephone calls were made 2 weeks, 4 weeks and 6 weeks after the initial mailing, with a second copy of the survey sent to nonrespondents at 4 weeks. Survey 2 was sent in September 1989 to 600 randomly selected school district superintendents in California, which represents about half of the districts in the state. A follow-up mailing to nonrespondents, with a replacement questionnaire, was made in December. The cover letters for the county and district superintendent surveys explained that the questionnaire could be completed either by the superintendent or a designated associate.

The seven visits to program sites were conducted in the fall of 1989. These visits included tours of facilities and tape-recorded interviews with key personnel. Most programs selected for case study came to our attention from the county superintendent and county director responses to survey 1. Sites were selected to reflect a diversity of curricular approaches, educational strategies, program size, urbanicity, geographical location, range of educational strategy and program focus (see sidebar).

Results

Replies to survey 1 were received from 34 of the 58 county superintendents' offices, a response rate of 59%, and from 43 of the 54 CE county directors, a response rate of 80%. Replies to survey 2 were received from 326 district superintendents' offices, a response rate of 54%.

Most responding districts (45%) were elementary level, with about equal numbers of secondary (25%) and unified districts (26%) represented in the sample (table 1). Most responding districts classified themselves as rural (52%), with only a small number identifying themselves as urban (9%). Furthermore, 67% of the responding districts were experiencing a general population increase, with nearly half also indicating a substantial influx of immigrants from other countries (45%). In most cases (58%), the actual respondent to the questionnaire was the superintendent or assistant superintendent.

Overall, most district respondents rated agricultural literacy education as deserving moderately high priority, since the av-

TABLE 1. Description of sample for survey 2: district superintendents

Characteristic	%
Respondent completing survey (N=320):	
Superintendent	40.6
Assistant superintendent	17.5
Director of instruction	11.9
Principal or asst. principal	10.0
Curriculum coordinator	6.6
Vocational education coordinator	1.6
Teacher	6.6
Other	5.3
Total	100
Level of district (N=318):	
Elementary	45.3
Secondary	24.5
Unified	26.4
Other (e.g., post-secondary)	3.8
Total	100
Demographic self-classification of district (N=319):	
Rural	52.0
Suburban	29.5
Urban	9.1
Demographically diverse	9.4
Total	100
Current demographic trends, as noted by respondent (N=325):*	
General population increase	66.9
Rapid population increase from new business or industry	14.1
Influx of immigrants from other countries	45.1
Outmigration of population	4.0
Change from farming to industrial base	12.9

* Because categories are not mutually exclusive, they sum to more than 100%.

Jack Kelly Clark

Loma Vista Farm — once a weed-infested patch of hard clay dirt — is today a five-acre site with livestock, poultry, rabbits, waterfowl, a one-acre vegetable garden, a hydroponic greenhouse, barns and a classroom. Seventeen years ago Loma Vista teachers and students, — with the assistance of the Solano County 4-H leader — began to till the dirt, haul in the manure, and obtain the seed. Today, recycling and conservation are an integral part of the farm. Monitors from Loma Vista school take all the leftovers from lunch down to the farm and sort out the aluminum, tin, glass and food materials, the latter to be used as farm compost.

At left, children learn characteristics of Aracana chickens in an educational "scavenger hunt."

Snapshots of current agricultural literacy programs

Ellen L. Rilla ❑ Daniel J. Desmond ❑ Marc T. Braverman ❑ Richard Ponzio ❑ Faye Lee
Elizabeth Sandlin ❑ Carol Kaney

Site visits to selected schools provided snapshots of agricultural literacy programs across the state. Schools were chosen to represent a wide variety of situations. In order of importance, selection criteria were:

- community size and urbanicity (i.e., urban to rural);
- geographical region;
- curricular approach, educational strategy, and program focus.

Most sites selected were identified from the survey sent to county superintendents and UC Cooperative Extension (CE) county directors.

We found that the staff at each site showed exemplary commitment to developing their students' agricultural understanding, often through "learning-by-doing." The use of agricultural themes as a basis for instructional design appeared to fit well with the new California educational frameworks, which emphasize thematic approaches to teaching.

Although we found staff members to be generally upbeat about what they were accomplishing, personnel at each site told us they considered their program's future to be at risk due to lack of adequate funding and district administrative support. In most cases, staff at these sites had given little thought to formal evaluation of program effectiveness, as illustrated by one director who, when asked how he knew his program was successful, stated, "Because our phone rings off the hook."

Analysis of these programs reveals that good agricultural literacy programs require at least four components: (1) a dedicated, visionary leader; (2) a high level of commitment from the staff and administrators; (3) a strong link between agricultural literacy education and classroom-based learning; and (4) adequate material resources.

The sample included the following programs:

Anderson Valley Ag Institute at Anderson Valley High School in the rural community of Boonville, a fertile agricultural valley in Mendocino County. Formerly a traditional vocational agriculture program with a small enrollment, the institute now offers a wide range of agricultural courses to 90 students.

Loma Vista Farm, adjacent to Loma Vista Elementary school in Vallejo, located in Solano County. The area was a weed-filled, five-acre parcel when Loma Vista teachers and students began cultivating part of it in September of 1974. Today the farm is a school-community project that offers a multitude of teaching and learning opportunities for students and adults.

Manual Arts High School in south central Los Angeles. Manual Arts is a comprehensive three-year high school with 1,800 students and a 50% daily attendance rate. One special education instructor teaches science, using a former vocational agriculture area of the school as her outdoor science lab.

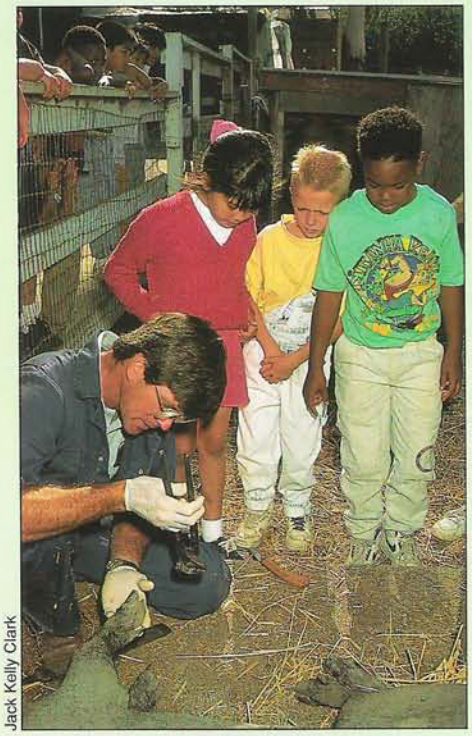
Markham Junior High School in Watts, a low-income area of Los Angeles. Seventh and eighth grade students (approximately 90 students per year) work on horticultural and floricultural projects on a 1/4-acre garden site on the school campus.

Mewah Mountain High School, a continuation high school in Larkspur in Marin County. Approximately 20 students, 16 to 18 years old, attend afternoon classes in an agroecology program. The goal of the program is to enable students to continue their education. Students strive to attain academic success and the confidence and ability to grow food in an environmentally sustainable manner.

Rock Creek School, a K-6 elementary school located in Auburn, a rapidly growing semi-rural community east of Sacramento. The school houses a Life Lab garden site with program emphasis on science and nutrition. The lab coordinator and individual classroom teachers rotate class use of the site. Life Lab is a life science curriculum developed in the early 1980's in a Santa Cruz school district and adopted nationwide.

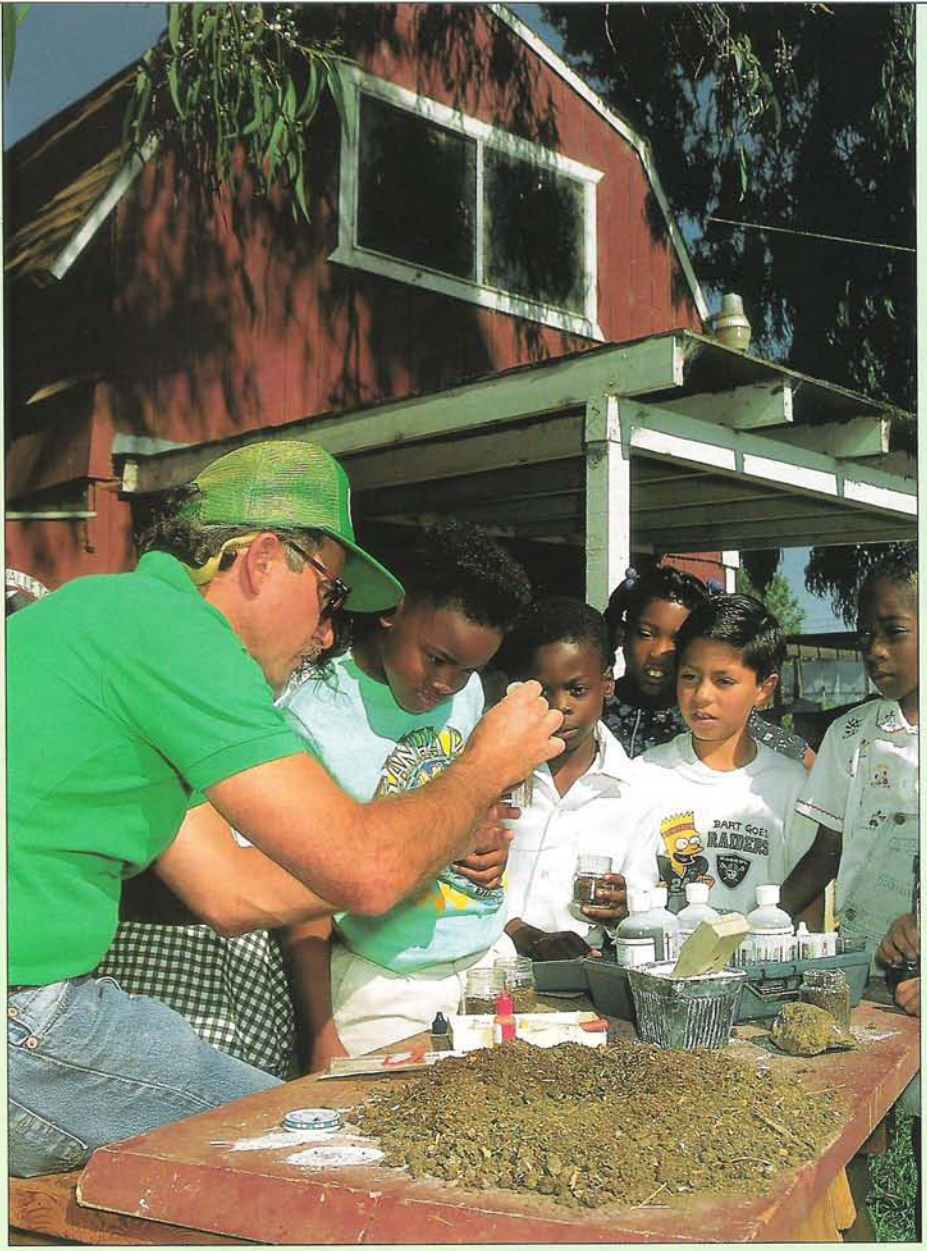
Victory Elementary School in Stockton in San Joaquin County. The agricultural literacy programs here are conducted by kindergarten and fifth-grade teachers who attended the "Ag in the Classroom" summer training seminar for teachers. Neither grade teaches a separate unit on agriculture, but both integrate agricultural concepts into their science, history, social studies, literature and math units.

Editor's Note: Sidebar text is drawn largely from the report Agricultural Literacy Education in California Schools, *published by UC Cooperative Extension, North Central Region, 1990.*



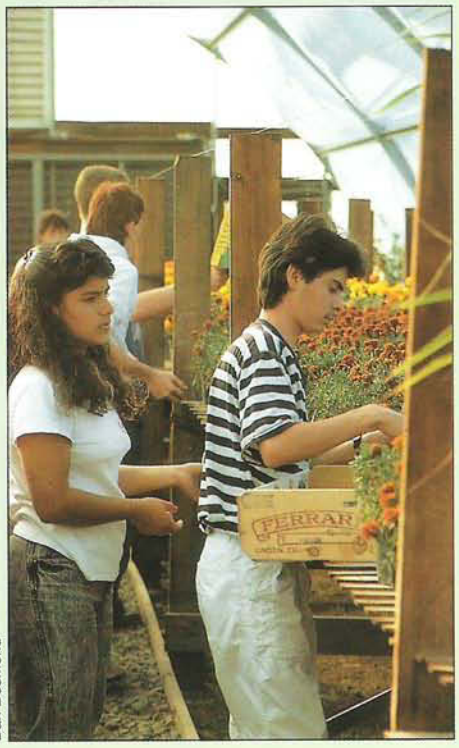
Jack Kelly Clark

More than 10,000 Vallejo school district students visit Loma Vista Farm each year, from kindergarten through high school, including special needs students. Many days there are 150 students using the facility — taking interpretive walks, harvesting sunflowers, weighing baby animals, compiling information in science journals, gathering eggs, and baking bread in adobe ovens. Above, a veterinarian checks and trims hoofs of Yucatan swine.



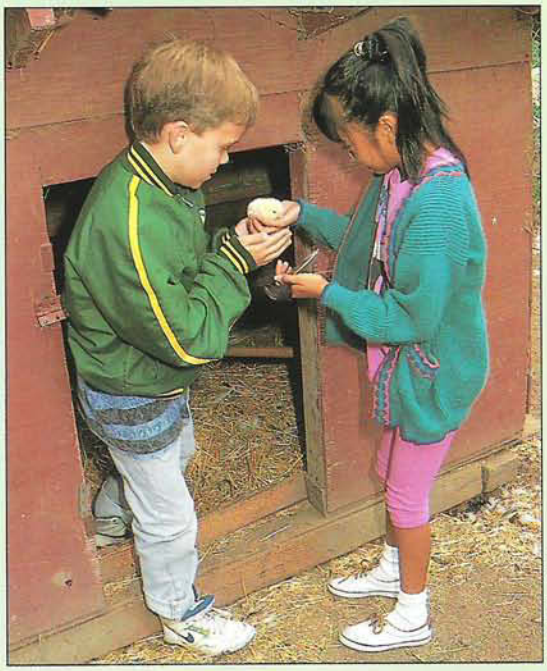
Jack Kelly Clark

Above, Loma Vista Farm instructor demonstrates the differences between the composted soil of the farm, and the hard-packed clay dirt in the surrounding area.



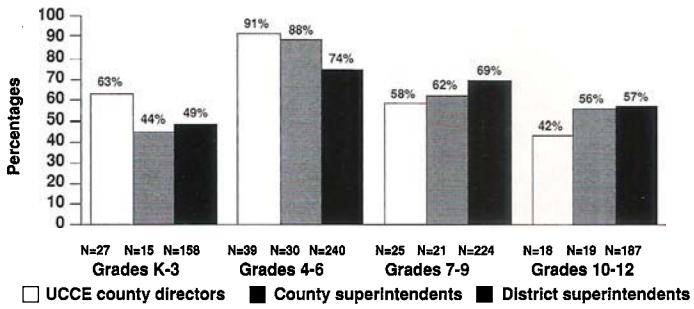
Dan Desmond

At right, students gather a chick to be weighed, part of the "chick it out" math project. Due to an early reliance on extramural funding for the farm (and required reports), Loma Vista personnel collected data that indicated significant gains ($p<0.01$) in both reading and math for students attending sessions at the farm when compared with non-farm involved students. Throughout the initial grant period (and continuing to date), learning-disabled students were integrated into activities on the farm. As with the founding study, data for the three years indicates improved performance for all three target groups, the regular elementary, the trainable mentally retarded, and the learning disabled students.



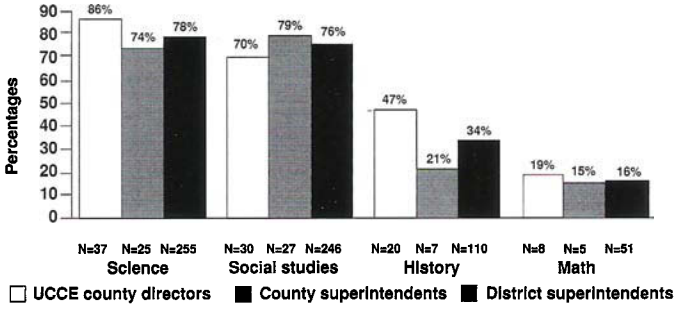
Jack Kelly Clark

At left, students at **Anderson Valley Agricultural Institute, Boonville High School**, tend greenhouse marigolds as part of floriculture and marketing experiments.



Note: Each bar represents the percentage of the respondent group that selected the curricular area indicated. Selection of more than one curricular area was permitted.

Fig. 1. Appropriate grades for teaching agricultural literacy, as judged by three survey respondent groups.



Note: Each bar represents the percentage of the respondent group that selected the curricular area indicated. Selection of more than one curricular area was permitted.

Fig. 2. Appropriate curricular areas for teaching agricultural literacy, as judged by three survey respondent groups.

erage rating of 3.40 is somewhat higher that the neutral middle point of 3.00 (table 2). This judgment varies according to type of district, with rural districts considering the topic more important than urban districts (3.60 vs. 3.00), and high school districts considering it more important than elementary districts (3.67 vs. 3.26).

The overall ratings of county superintendent offices and CE county directors were 5.41 and 6.00, respectively, on a 7-point scale. One must be cautious in comparing these ratings with the district ratings because these respondents were rating the importance of the topic rather than the priority it deserves among other curricular subject areas. However, in purely numerical terms the ratings of the county superintendent offices and the CE county directors were considerably higher than the ratings of the district superintendent offices. (On a 5-point scale those average ratings would translate into 3.94 for county superintendents and 4.33 for county directors.)

The late elementary years, grades 4 through 6, were noted most often by all three groups as the appropriate time to teach agricultural literacy concepts (fig. 1). The groups differ on their second choice, with most favoring the junior high school grades (7 through 9).

Science, followed closely by social studies, is considered the most appropriate subject area in which to present agricultural literacy concepts (fig. 2). For the district respondents, our data allow us to examine possible differences among types of districts. These curriculum judgments do not differ by the urbanicity of the districts (rural, suburban, urban, or diverse). However, when looked at by grade levels served by the districts, elementary districts favor social studies and science about evenly (78% vs. 74%), whereas secondary districts rather convincingly favor science over social studies (87% to 69%). This may suggest that the scientific elements of agricultural literacy might be treated more extensively in high school than in earlier grades.

In addition to judgments about various facets of agricultural literacy programming, respondents were asked to identify existing programs in their geographical domains. Only 8% of respondents sent descriptive information about their agricultural literacy programs. Thus, although the topic was perceived as moderately important, few districts identified programs to address it. This suggests two possibilities: the actual extent of programming may be low, or administrators may have limited awareness of programs that do exist. Either possibility is discrepant with the administrators' own ratings of importance for the topic.

Because a wide variety of topics and issues can be included in any agricultural literacy curriculum, hard choices need to be made about where educational emphasis should be placed. In the survey sent to district superintendent offices, we listed 11 specific agricultural topics and issues and asked respondents how important it is for students to have a general understanding of each one by the time they leave high school (table 3). To facilitate interpretation of these ratings (which were made on a four-point scale from "not important" to "essential"), we computed a critical difference estimate that allows us to judge whether the ratings for any two items should be considered significantly different from each other. This critical difference, at the 0.05 alpha level, is 0.12. In other words, the difference between any two ratings needs to equal or exceed this amount in order to be considered a true difference statistically. (This difference computation is approximate rather than exact, because it utilizes a pooled item variance estimate rather than the actual variances for each of the 55 possible item pairs.) For example, the rating for item 1 should be interpreted as significantly higher than the rating for item 4 since the difference between scores is 0.48. However, item 1 is not rated significantly higher than item 2 (since the difference is only 0.03) or item 3 (since the difference is only 0.06). From a statistical viewpoint, the ratings for items 1 through 3 should be considered equivalent to each other.

TABLE 2. Priority for teaching agricultural literacy by type of district

Type of district	N	Average priority* rating
All districts	315	3.40
Urbanicity of district:		
Rural	162	3.60
Suburban	88	3.15
Urban	29	3.00
Diverse	30	3.43
Level of district:		
Elementary	136	3.26
High school	78	3.67
Unified	82	3.26
Other	12	3.83

*Scores in the last column are based on a range of 1 (very low priority) to 5 (very high priority).

TABLE 3. Relative importance of selected agricultural topics for inclusion in agricultural literacy curriculum

Topic	Rating of importance*	Rank
Toxics in the environment	3.38	1
Toxics in the food supply	3.35	2
Water quality and policy	3.32	3
Erosion and soil quality	2.90	4
Agricultural vs. non-agricultural land use	2.88	5
Which agricultural products areproduced in California	2.63	6
How agricultural products are processed and marketed	2.56	7
How livestock and dairy products are produced	2.55	8
How crops are grown and harvested	2.53	9
Economics of farming	2.51	10
Farm labor	2.32	11

*All responses were made according to the following scale: 1 = not important, 2 = moderately important, 3 = very important and 4 = essential.

From this analysis, we can see that respondents consider "toxics in the environment" (rated 3.38), "toxics in the food supply" (3.35), and "water quality and policy" (3.32) to be the most important topics by far. These three are approximately equal in priority, but they far exceed the next topic, "erosion and soil quality" (2.90). When the overall ratings were examined according to the urbanicity of the districts, analysis revealed that the relative rankings from rural, suburban, and urban districts do not differ substantially, although there is a general tendency for rural respondents to rate most of these topics slightly higher than urban respondents. The largest difference occurs for the topic "agricultural vs. non-agricultural land use," which rural respondents rate 2.99 and urban respondents rate 2.54.

Carol Kaney

Student groups prepare individual garden plots at Markham Junior High in Los Angeles.

Discussion

In this survey study, we sought to determine the views of three important stakeholder groups — county and district educational administrators, and CE county directors — on agricultural literacy programming. The district administrators' assignment of moderate priority to this subject suggests a perceived educational need, but it does not match the critical importance assigned to the topic by CE county directors, or by the National Research Council and other nationwide observers. The discrepancy is a reminder that agricultural literacy curricula must compete with other important curricular content areas for limited classroom time and resources.

The responses of our different samples form a consistent picture of how agricultural literacy can fit into the overall flow of educational programming. Respondents favored addressing the topic in the middle grades (4-9), through the subject matter areas of science and social studies. Rural districts appear to be more concerned about agricultural literacy than urban districts, with suburban districts in between. This trend is evident both in the slightly higher ratings assigned to the specific topic areas by rural districts and in their higher levels of response to the survey. Consultations with urban educators will be particularly important in determining the possibility of agricultural literacy programming in nonrural areas.

In identifying the most critical agriculture-related topics for youth to understand, district administrators consistently selected those characterized by high public debate and obvious social applicability. Toxics in food and the environment, water quality, soil quality, and land use received high ratings while the more fundamental areas of how agricultural products are grown, harvested, processed and marketed received low ratings. This perspective may not sufficiently reflect the degree to which knowledge of those basic topics can create a foundation for understanding and considering the more immediate issues. We believe that a comprehensive view of agricultural literacy needs to take both kinds of subject matter into account.

The exceptions to the trend of higher ratings for high-profile subjects were the low ratings given to farm economics and farm labor, which are often in the news through reports about farm foreclosures, immigration policies, etc. It may be that the survey respondents simply consider these issues to have limited applicability to the general public — unlike, for example, water policy issues. If agricultural educators think economic issues are important for the public to understand, this trend indicates an opinion gap that will need to be bridged in moving toward a consensus on the content of agricultural literacy programs.

Future directions

Major new educational initiatives will be required if we are to significantly improve the public's understanding of agriculture in our society. These initiatives will require partnerships among universities, schools, nonformal programs such as 4-H, and agricultural industries. Scientists, policymakers and others who strongly support these efforts must note that, as this study indicates, many school administrators do not share the same level of concern or awareness. Furthermore, both our survey and our case studies reveal that the development of actual agricultural literacy programming is at a very formative stage. Most of the agricultural literacy programs that currently exist in schools lack broad-based district support, and face substantial uncertainty regarding their futures.

For proponents of agricultural literacy education, this study suggests that an immediate task will be to broaden the consensus in the educational community about the urgency of this topic. Longer-range tasks will be to define the components of agricultural literacy, develop innovative teaching methods and build educational programs.

The nation's land grant universities are well-poised to provide leadership and advocacy for agricultural literacy programs, for a number of reasons. First, as public institutions they have a stake in framing the issues and program content without bias toward any single perspective. Second, through the 4-H program and other Cooperative Extension efforts, they have broad experience and a continuing commitment to educating the public about agriculture through nonformal channels. Third, they have access to substantial resources through their own educational and agricultural departments, as well as their institutional affiliations with the U.S. Department of Agriculture and the Cooperative Extension system nationwide. Fourth, they are often in close contact with local school systems, community agencies and the private sector. In California and other states, land grant universities can and should be active members of the coalitions formulating curricular goals and instructional approaches in this critical educational area.

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The authors wish to acknowledge and thank the other members of the research team: Daniel Desmond (County Director, Sonoma County), Richard Ponzio (4-H YD Specialist, School of Education, UC Berkeley), Faye Lee (4-H YD Advisor, San Francisco-San Mateo Counties), Elizabeth Sandlin (4-H YD Advisor, Marin County), and Carol Kaney (4-H Program Coordinator, Sonoma County).