

1 and 2. Earliness of production, as expressed by the appearance of the first spear (character 1) and production of the first eight spears (character 2), was strongly influenced by climatic conditions.

There appeared to be no difference in males and females in regard to earliness of production, although all other plant characteristics studied showed sex differences (table 2). However, these differences were not consistent in all varieties in all cases. For example, the males produced more spears in all varieties except variety 711. Also, the female plants produced heavier spears in each variety, but the difference between males and females was not consistent from variety to variety.

The total yield in number of spears harvested in 1967 for the highest yielding plant, the lowest yielding plant, and the varietal average for the 10 plant populations, are given in table 3. Also listed is the highest yielding clone and the lowest yielding clone within each variety. A comparison between the highest yielding plant and the varietal mean indicates that each variety possesses plants of superior production potential. The comparison between the mathematical mean calculated for the high and low yielding plants, and the varietal mean, suggests that fewer plants are high yielding than are low yielding. Considerable progress could be made in increasing asparagus yields by the elimination of the low yielding plants.

TABLE 3. VARIATION IN TOTAL YIELD FOR FIVE ASPARAGUS VARIETIES.*

Varieties	Avg. for variety	Range (plants)†		Range (segments)‡	
		High	Low	High	Low
Line A NJ28xD37	11.36	16.80	6.40	23	3
Line B 500W	9.88	20.00	6.20	25	3
Line C 309	10.89	17.40	6.60	24	3
Line D 711	14.68	26.20	7.20	39	1
Line E X	12.73	23.80	7.20	33	4

* Number of spears produced in 1967

† 10 plant population

‡ 50 segment population

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AIR POLLUTION and agriculture TODAY

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Agriculture still suffers huge financial losses each year from air pollution, but is now itself being examined with increasing vigilance as a source of pollution. Controlled fire has always been used by farmers for the preservation of food, for the destruction of pests and diseases, and for the disposal of wastes. Disposal of wastes—including straw, stubble, tree prunings, dead trees, and brush clearing on rangeland—produces smoke, odors, dust and air-borne particulate matter that is increasingly objectionable (but not necessarily harmful) to city dwellers as they continue to move out into rural areas. On the other hand, people-produced damage to farm crops from photo-chemical pollutants (resulting mostly from automobile exhaust) often occurs in the absence of analytical instruments that show first signs of air pollution. It is therefore important that there be continued surveillance of air pollution damage to agriculture, as well as measurement of amount and effects of agriculturally-produced pollution. This article discusses legislation, regulations and control aspects of the air pollution problem on a statewide basis, and offers a course of action for the future.

MANY OF THE normally accepted practices of agricultural husbandry in the past, although contributing comparatively little to local air pollution, have now become objectionable sociological problems. The greater congestion of people on formerly open land is the major reason for the increased emphasis on the problems of agricultural operations.

Enabling legislation

Legislative attempts at controlling air pollution in California began with passage of the 1947 enabling legislation which provided authority to county boards of supervisors to establish a county air pollution control district. County air pollution control districts have not had the power to control agricultural burning. However, some single-county districts have prescribed certain limited conditions under which such burning may be done.

Formation of the San Francisco Bay Area Air Pollution Control District by

special action of the California legislature in 1955 provided a special district to control and suppress air pollution in that area. This multi-county district consists of six counties in the San Francisco area. Three additional counties may join at any time, upon appropriate action of their boards of supervisors. Open burning is prohibited by regulations of this District. Farmers in the Bay Area District operated until recently on a temporary exemption from this rule. However, orchardists in the counties of the Bay Area Air Pollution Control District now operate under a permit system. Permission to burn is granted only during a specified period of the year. Permission depends on meteorological conditions, time of day, wind velocity and direction, and moisture content of prunings. These restrictions were imposed even though nearly 75 per cent of the agricultural wastes are burned between November and April, when San Francisco Bay Area photochemical pollutant levels are significantly lower.

California Air Resources Act

The most recent comprehensive effort at air pollution control was the California Air Resources Act of 1967. Besides continuing the auto emissions control program, this Act directs a 14-member board to divide the State into the principal airsheds, to adopt standards for each airshed area, and recommend appropriate rules and regulations to be adopted by local governments. Excluded from provisions of the California Air Resources Act are the Bay Area Air Pollution Control District and the Humboldt County district. This Act also provides for the establishment of regional boards, but emphasizes that control and enforcement should be carried out locally, namely by the county. However, if standards once established are not enforced locally, the state now has the power to step in.

Agricultural burning

Results from tests conducted at the Statewide Air Pollution Research Center, University of California, Riverside, showed the following maximum expected emissions of hydrocarbons (saturates, except methane, olefins and acetylenes) per ton of waste burned: for fruit tree prunings, 14 lbs; rice straw, 9 lbs; barley straw, 18 lbs; and dry native range brush, 7 lbs. Green native brush could be expected to produce as much as 36 lbs of hydrocarbons per ton, but this type of waste constitutes a relatively small portion of the material burned in a range improvement program. In comparison, automobile exhaust produces about 130 lbs of the same hydrocarbons (without exhaust emission controls), per ton of fuel. The contribution of total hydrocarbons from agricultural burning is considerably less than from the automobile exhaust.

More control

Even though progress is being made toward control of air pollution, including that caused by the internal combustion engine, agriculture, in at least the foreseeable future, can expect continuing damage to susceptible crops in and around population and industrial centers. Agriculture (especially flower and vegetable producers) may still be forced to relocate in some instances. Community concern and likely additional legislation will be directed more in the future toward solving urban aspects of the problem rather than with the loss aspects that plague agriculture. It seems abundantly clear, however, that the total community

will continue to become increasingly concerned about the quality of the air—and interested in controlling air pollution. Agriculture, therefore, can expect more controls.

Course of action

What should agriculture consider as a course of action? It is not simply a matter of chemical facts—the number of tons of hydrocarbons emitted. The community objects to seeing smoke, and agriculture does produce smoke in some of its operations. The community objects also to dust, and agriculture unavoidably produces dust once in a while. Agriculture must make adjustments as research facts, and economic feasibility permit. Financial support for necessary research will hasten the development of alternative methods. Agricultural leaders should make a concerted effort to be represented in public policy decisions involving the standards and the regulations that will determine the quality of the atmosphere.

Facts, not emotions

Technological advances have demonstrated that alternative methods to the use of fire for agricultural waste disposal are advantageous in some instances. Many such methods have become the accepted cultural practice, when economical and practical. Fire is an important management adjunct even in today's commercial agriculture, and in the management of wildlands. The fact still remains that in some instances the wastes or crop residues from agriculture do not lend themselves to simple disposal methods.

Prunings can be shredded as shown but any large limbs must be removed and disposed of outside the orchard.



When burning orchard prunings, a properly ignited and managed fire produces a minimal amount of objectionable smoke.

The distinction between the use of open burning for waste disposal and a management tool is not always clearly definable or widely understood.

Like the rest of the community, agriculturalists are not enthusiastic about controls and regulations. However, today's farmer is accustomed to both. Some of these controls are self-imposed; some result from actions by others within the agricultural community; and, in instances, some controls result from social pressure. Whatever the motivating force for regulation, control, or suggested alternatives to burning, the farmer is concerned that any such action be based upon a complete evaluation of all the available facts—which can come only from continued research.

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