

INTERPLANTING ROWS of asparagus with strips of grain, such as barley, for protection against wind erosion has gradually been accepted by most growers in the San Joaquin Delta area. Winter grain crops are used because physical characteristics of these plants are suitable and protection is needed most in May and June. The effectiveness of these inter-row plantings was proven in 1958-1959 tests with elaborate installations which were also described in *California Agriculture*. A simpler method for analyzing interplanting effectiveness has been adopted recently which also presents the results in a more descriptive way. Wind velocities over the ridges are recorded by anemometers set into the ground so that the cups are only 1 inch above the surface, as shown in the sketch. Each anemometer is electrically connected to a California spot climate recorder for continuous recording.

This new method was used for the first time in the 1960 tests, despite previous questions concerning reliability; first, as an opportunity for corroboration of prior results and second, in the case of agreement, this simpler method could be used confidently in further tests in modified interrow plantings.

Under conditions tested so far, data comparable with 1958-1959 tests were obtained as plotted on the graph.

Measurements were made on 16-inch-high ridges with interplanted barley grown to about 33 inches high. The barley strips were spaced at the standard plant-

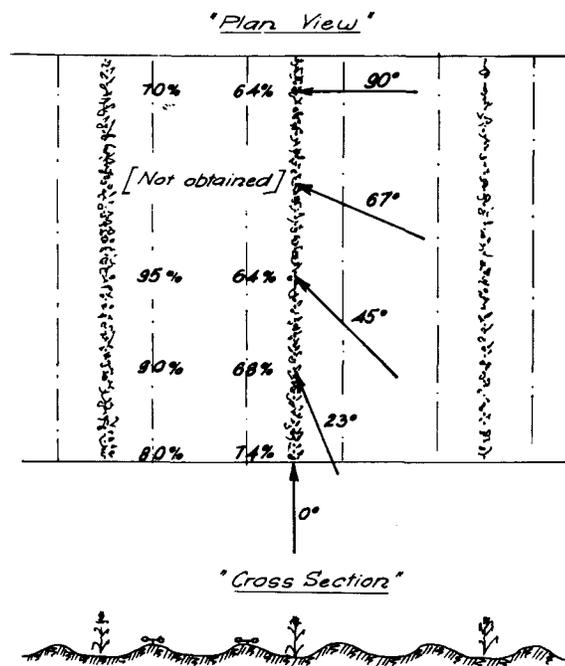
ing of about 8 feet. The solid curve in the graph shows that the wind was reduced to 55% of normal when blowing from a perpendicular direction (90° angle), and about as much or even a little more with angles near 45°. These reductions were to be expected because similar values were measured at a conventional wind break—a row of trees—downwind to a distance about five times the height of the trees. As the barley is about 17 inches higher than the ridges, five times this height would be 85 inches. The distance of the ridges from the barley strip is only 48 inches, however, and for a 45° wind, the path would be 68 inches, which is within the optimum protection zone.

The even somewhat greater protection in winds of about 45° can be caused by the greater compactness of the barley blades when looked at from an angle other than 90°. This may also explain the

good protection noticeable for wind directions parallel to the ridges (0°-angle). As the damaging winds always are gusty, they are oscillating in direction as well as in velocity, so that they frequently depart from the parallel direction toward the 45° angle.

The scattering of plotted points is an indication of some of the difficulties inherent in this method. The various ridges can be differently shaped, for example, thus influencing the streamflow above. Blowing dust, entering the anemometer bearings, can change their calibration. Soil erosion during one recording period raised the height of the control anemometers in the non-interplanted sections to somewhat more than 1 inch and higher air-speeds were indicated there. About 50 hours of records could still be used, after elimination of such erroneous readings. On the other hand, a certain degree

PLAN VIEW of test plot showing wind velocity in per cent of normal over ridges in alternate interplantings for different wind angles.



An alternate method for analyzing the effectiveness of wind erosion protection in asparagus fields of the San Joaquin Delta peat regions substantiated previous results proving the value of the practice of interplanting barley in every row, and showed success with alternate row planting mainly when done perpendicular to the critical winds.

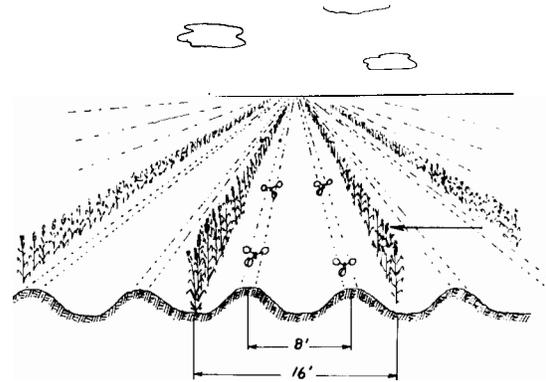
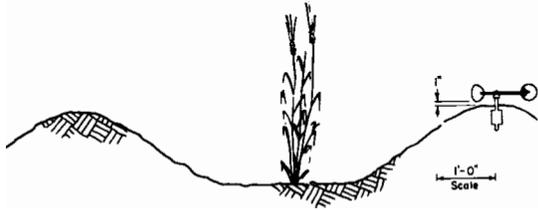
H. B. SCHULTZ • A. B. CARLTON • F. LORY

Interplanting Methods for

WIND EROSION PROTECTION

in San

SKETCH BELOW details recording anemometer placement on asparagus ridge in interrow planting of one row of barley per strip. SKETCH TO RIGHT, shows field installation of recording anemometers on asparagus ridges interplanted with barley in alternate rows.



of inaccuracy was allowable because wind velocities below 15 mph at a 6-foot height were not found critical under usual field conditions. Wind speeds of more than 20 mph were seldom registered. Therefore, a wind reduction to 75% of normal appears to be sufficient.

Under these circumstances, however, low stands of interplantings (6 inches higher than the ridges) are considered barely sufficient. The dashed line in the graph is based on tests of two methods of this kind of modification. One low stand was the result of late planting intended to eliminate interference with earlier ground work needed at the ridges. The other low stand was caused by cutting off the barley heads before maturation in order to avoid weed problems in succeeding years. The graph also shows that, under these conditions, the wind protection decreases for winds departing from the perpendicular direction—in contrast to the curve for the standard planting.

Further tests with modified interplantings were carried out in the 1963 season, when a plot was made available for testing wind flow over barley strips planted in every other row. Wind velocities were measured over both ridges. As can be seen in the sketch, a dual installation was chosen for the purpose of checking and as a guard against sudden change of condition of one anemometer. As a further precaution for protection against erosion

at the anemometer spots, the ridges were covered with sheets of paper.

Similar installations, as seen in the sketch (recorders are not shown), were placed on ridges without interplantings (controls), on ridges with standard interplantings of barley, as well as oats. Unfortunately, the barley was diseased and developed poorly, reaching a height of only 28 inches. The protection provided by the standard interplanting was, therefore, 10% weaker than in previous years, and no differences resulted from the test comparing barley with oats. These results should not be considered final. More data is needed for a year when better developed interplantings are available.

For the same reason, data obtained on four test days for the alternate planting method, shown on the plan view, should be considered as tentative. However, it can clearly be seen that wind protection is much superior on the ridges which are close to the windward barley strip. If plotted into the graph, data from this ridge would occupy a position in between the two curves. The other ridge appears to be nearly unprotected in wind angles around 45°, but a perpendicular wind direction seems to give a fair amount of shielding. Some wind reduction could also be obtained for parallel wind. Here again the strong oscillations caused the direction to deviate so much that both ridges received some shielding. The benefit was a little greater at one ridge, because the wind was not exactly parallel and included a component of about 5 to 10° from that side more often than the other.

The data obtained so far indicates that the practice of interplanting in alternate asparagus rows is feasible with rows perpendicular to the critical winds. This should be north-south in the northern part of the peat soil region where the winds are directly from the west. Toward the southern edge of this region—southwest of Stockton—most of the winds with critical velocities are from west to northwest,

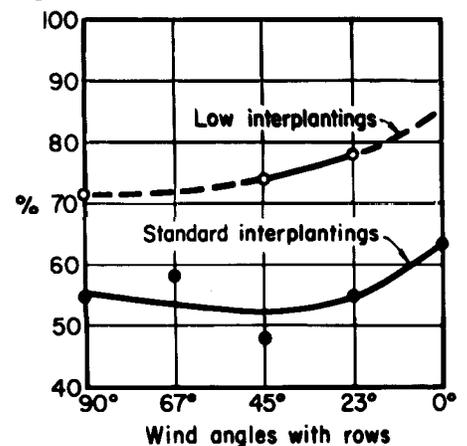
and asparagus rows planted northeast-southeast could be protected in a great number of cases by barley strips in every other row. Fields planted in other directions can obtain only partial protection from this method. Further verification of these results will be tested next season if better plantings and higher wind velocities are available. In previous years, testing, winds of 15 mph occurred, as compared with 5 to 12 mph winds in 1963.

Interplanting in alternate asparagus rows, if feasible, would allow easier harvesting, and reshaping of ridges, which is necessary several times during harvest, and a reduction of winter problems with volunteer barley.

H. B. Schultz is Specialist in the Experiment Station, Department of Agricultural Engineering, University of California, Davis; A. B. Carlton is Specialist in the Experiment Station, Department of Soils and Plant Nutrition, Stockton; and F. Lory is Laboratory Technician, Dept. of Soils and Plant Nutrition, Davis.

Dell Aringa Bros., asparagus growers on King Island, San Joaquin County, assisted with this study by planting and managing the interrow grain crops.

GRAPH of wind velocity over interplanted asparagus ridges in per cent of velocity over non-interplanted ridges. Anemometer cups 1 inch above ridges.



Joaquin Asparagus