TABLE 1. LENGTH DISTRIBUTION FOR ASPARAGUS SPEARS OVER 3/8-INCH DIAMETER PRODUCED ON MACHINE-HARVESTED BEDS

	Nonsel. on-time cuttings	Selective One-day cuttings	Selective Two-day cuttings
Number of cuttings	6	21	13
Total No. of spears*	16,950	9,950	10,500
Percentage of total number of spears			
0–3¾" length	52.8†	12.0	11.7
3¾–4¾" length	8.4	5.5	5.5
4–6¾" length	10.3	16.2	13.5
6–8" length	12.0	35.6	30.2
8–10" length	9.1	30.7	39.1
10–12" length	5.0		
12–16" length	2.3		
Over 16" length	0.1		

* Totals for nonselective cuttings obtained by counting all emerged spears over 3/8-inch diameter just prior to each cutting. Selective totals are recovered plus missed spears.

† Determined by subtraction. All other percentages are based on counts made after harvesting and include recovered plus missed spears.

TABLE 2. CULL PERCENTAGES IN ASPARAGUS HARVEST TESTS

	Percentage of total trimmed weight		
	Hand	Selective (1.7 mph)	Nonselective (2.5 mph)
Tip damage	1.7	7.5	3.5
Side damage	0.0	1.7	0.7
Open heads	5.1	12.6	11.2
Crooks and misc.	5.1	3.8	6.4
All culls	11.9	25.6	21.8

TABLE 3. COMPARISON OF ASPARAGUS YIELDS FROM MACHINE AND HAND HARVESTING

	Good Spears	Good + culls
Total yields, lbs. per acre*		
Hand-cut	2,030†	2,310†
Selective machine (1.7 mph)	1,080	1,445
Nonselective machine	925	1,185
LSD, 1% level		126
Yield ratios, machine ÷ hand		
Selective, 1.7 miles per hour	0.53	0.63
Selective, 2.6 miles per hour	0.50	0.61
Nonselective, 2.5 or 3.25 Miles per hour	0.46	0.51

* Yields are based on 3½-inch + 4½-inch trimmed weights of spears over 3/8-inch diameter and are for a period of 58 days.

† Equivalent to about 4,000 and 4,600 lbs. per acre on a 7-inch length basis.

TABLE 4. ANALYSIS OF ASPARAGUS YIELD DIFFERENCES FOR GOOD SPEARS PLUS CULLS*

	Selective	Nonselective
Number of spears produced, per cent of hand-cut	90	129†
Number of spears shorter than 3¾", per cent of total spears produced	12	53
Missed spears over 3¾" long, per cent of total over 3¾"	12.5	3.6
Weight per trimmed spear (3½" + 4½"), per cent of 4½" hand-cut	90	88

* All percentages based on spears over 3/8-inch diameter.

† Averaged 112 per cent for periods not affected by disking of hand-cut beds.

TABLE 5. MACHINE CAPACITIES FOR 6-FOOT ROW SPACING IN ASPARAGUS

	Selective		Nonselective	
	1-row	3-row	1-row	3-row
Assumed speed, miles per hour	3.0	3.0	3.5	3.5
Average acres per hour (25% lost time)	1.6	4.9	1.9	5.7
Days between cuttings	1	1	4–7	4–7
Assumed hours per day	20	20	10*	10*
Crop acres per machine	33	100	105	315
Man-hours per acre per year (independent of acres per machine)	28	9	5	1.7

* For average time of 5½ days between cuttings. Would be 12 hours per day at minimum interval of 4½ days in warm weather.

Wood processing RESIDUES *—disposal and use in Shasta County*

WILLIAM A. DOST

WOOD PRODUCTS MANUFACTURE is a vital segment of the economy of Shasta County; however, as with most industry, it is not an unmixed blessing. Wood products manufacture is essentially a reduction process and residues generated at each stage have become increasingly acute in recent years. Operators are faced with the necessity of increasing the percentage of raw material converted to marketable products in order to maintain a competitive position. On the other hand, they are faced with increasing pressure from the community to reduce or eliminate the smoke and ash problems caused by common residue disposal methods.

Industry efforts

Industry efforts to reduce the problem through increased use of residues have been conducted sporadically by individual companies—not only in the Shasta area, but throughout the West. End glued lumber, pulp chips, particleboard, boiler fuel from waste wood, and horticultural products from bark are examples of the improved use of residues by Shasta County. Complete utilization is a difficult goal to achieve, however, even by the most efficient mills.

Paradoxically, increasing use of residues has made residue disposal more of a community nuisance. A properly operated teepee burner of the right size is relatively smoke and cinder free when burning the residues from a mill without by-product recovery. However, even the best burner operating techniques are not adequate to prevent smoke and cinders when the usable slabs, edgings and other large chunks have been removed. The sawdust, shavings and bark remaining tend to settle in a compact mass on the burner floor—making it virtually impossible to attain the temperature necessary for a nuisance-free operation.

Few solutions

Very few operators have been able to completely eliminate the problem. The Shasta County wood processing industry, recognizing a common interest in residue disposal progress, formed the Shasta County Forest Products Council with the specific task of coordinating the activities of its members and conducting research leading to reduction of the problem.

At the present time most mills have taken advantage of the obviously profitable uses for wood residues. What remains are, in general, a series of economically unattractive alternatives. Industry management must select the least undesirable of these options. The Forest Products Council's request to the University of California for a study of the amount of residues developed at individual mills in the County was made to give industry an informed approach to the problem. The study was undertaken as a cooperative project with the University's Agricultural Extension Service and Forest Products Laboratory, supported in part by a grant from the Council. Only member firms of the Council were included and basic data were supplied by the cooperating firms. This information was supplemented by data collected in field studies, when it was necessary.

In 1966, the cooperating mills processed more than 391 million board feet of logs containing an estimated 60 million cu ft of wood and an estimated 12 million cu ft of bark. Lumber processed in planing mills and by other secondary manufacturers totaled more than 458 million board ft. The amount of residue generated in the processing of wood is dependent on the size, soundness and species of the logs, the efficiency of the operation, and the products produced. The estimated totals for the cooperating firms are given in tables 1 and 2.

Residue use

The study indicated that the industry is increasing its use of residues. Prior to 1965, only four county sawmills operated wood chipping facilities. By the end of 1966, all but the two smallest had chipping facilities in operation. Recent installations which use other residue fractions are the bark recovery and sawdust-fired steam boiler at one plant and the system for fuel use of sander dust in another. The Shasta County operations recovered nearly 1,750 lbs per 1,000 board ft in 1966, compared with the statewide average of 1,200 lbs per 1,000 ft of logs processed in 1965.

However, only slightly more than half of the residue generated in the county is presently being put to economic use. From a qualitative standpoint, the problem is even more difficult in that a large percentage of the material usable under the technology and economics of today is already being recovered. Although the county industry fares well in comparison today with the rest of the state, effective government control of sources of air pollution can be anticipated with certainty —the only matter of doubt is when it will come. The wood manufacturing industry can and must find solutions to the problem of how to cope with the remaining residue or it will be unprepared for the controls that are inevitable in the future.

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TABLE 1. WOOD RESIDUES AT SHASTA COUNTY FOREST PRODUCTS COUNCIL PLANTS IN 1966
(millions of cubic feet)

	Developed	Used	Unused
	millions cu. ft.	millions cu. ft.	millions cu. ft.
Bark–Log yard	2.32	0.00	2.32
–Mill deck	10.23	3.66	6.57
Fine wood dust–green	7.03	4.77	3.11
–dry	0.85		
shavings–green	2.13	3.70	3.32
–dry	4.89		
Coarse wood chippable	18.39	14.49	3.90
dry trim & other losses	6.83	2.25	4.58

TABLE 2. WOOD RESIDUE TONNAGE AT SHASTA CO. FOREST PRODUCTS COUNCIL PLANTS IN 1966

	Developed	Used	Unused
	tons	tons	tons
Bark-Log yard	25,807	0	25,807
–Mill deck	108,544	37,012	71,532
Fine wood dust–green	89,924	57,406	43,516
–dry	10,998		
shavings–green	20,805	44,504	23,941
–dry	47,640		
Coarse wood chippable	236,722	175,109	61,613
dry trim & other losses	81,897	27,082	54,815

PLASTIC SHELTERS

for crop growth experiments in the field

V. H. SCHWEERS
R. M. DAVIS, JR.

SHELTERS ARE often necessary in experimental work with growing crops to protect research results from the influence of insects or insect-transmitted viruses or other diseases—without greatly altering the other important factors of environment such as light, soil and temperature. This article resulted from a study of the low sugar problem threatening cantaloupe production in several areas of the San Joaquin Valley. It describes a simple inexpensive framework covering a ground area 20 by 30 ft, and reports measurements of light, temperature and humidity within several such structures covered with various combinations of polyethylene and cheesecloth.

The main frame was a 2- by 4-inch truss at each end and middle of the shelter of the design as shown in the sketch. These were joined by 2 by 4 sills [(a)], 2 by 4 purlins [(b)], and a 2 by 4 ridgeboard [(c)]. The covering rested on ¼-inch marine plywood ribs, 2 inches wide and 8 ft long, spaced at 3-ft intervals, and attached to sill, purlin and ridge as shown by the dotted line in the sketch. The houses were placed with the ridge running east and west. At the entrance on the end of the house, a double door, plastic-covered vestibule was built as an extra insect-proofing precaution.

An exhaust fan was installed in each house which had the capacity to move the total house air volume each minute. Temperature and humidity measurements were made with fans both off and on. The fan exhausted at the midpoint of one side. For the exhaust stream, an insect proof, cheesecloth covered cage, 3 by 3 by 8 ft extended outside the house. A ¼-inch

CROSS SECTION OF FIELD CROP SHELTER SHOWING CONSTRUCTION DETAILS AND SPECIFICATIONS