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Boards For Leaf-Cutting Bees In The Inland West

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Efficiency in pollinating alfalfa-seed crops and the recent rapid multiplication of the alfalfa leaf-cutter bee **(Megachile rotundata)** in the Inland West has caused a strong demand for boards used by this insect as nesting material.

Although the management of leaf-cutter bees is newly developed and changing rapidly, a recent survey where the bee recently has been used in the Inland West gave some indication of market needs for the board.

The survey consisted of personal interviews with entomologist, county agents, seed company managers, and growers considered representative of the five primary seed producing areas of the Inland West.

This bee is native to Europe and Asia and apparently was transported to the East Coast of the United States prior to 1935. Its population did not increase rapidly until it reached the Utah-Idaho area about 1958 in its move west. Then there were major increases in number and large populations soon were reported. This probably happened because the insect needs both alfalfa-seed production and wood nesting material in close proximity simultaneous with temperature and moisture conditions which allow its rapid increase.

Within the Inland West the leaf-cutter bee now is used extensively near Logan and Fillmore in Utah; Orovada, Nevada; Moses Lake and Walla Walla areas in Washington; southern Idaho from Burley through the Boise Valley and the adjacent area of Oregon. The alfalfa seed acreage harvested and yield of clean seed for these acres is shown in Table 1 as reported by the Crop Reporting Service for the leading state and total United States.

Table 1—Alfalfa seed production—acreage harvested and clean seed yield for leading states and U.S.

STATE	Acreage Harvested			Yield Per Acre			Total Clean Seed in Thousand lbs.		
	Average			Average			Average		
	1961-65	1966	1967	1961-65	1966	1967	1961-65	1966	1967
Calif.	114,400	105,000	97,000	405	420	460	46,040	44,100	44,620
Idaho	46,800	34,000	33,000	313	355	450	14,485	12,070	14,850
Wash.	27,600	25,000	24,000	449	445	590	12,381	11,125	14,160
Oreg.	19,700	15,000	14,500	500	470	620	9,525	7,050	8,990
Utah	42,800	35,000	31,000	167	140	190	7,236	4,900	5,890
Nevada	7,160	11,000	11,000	271	380	440	1,930	4,180	4,840
U.S.	697,080	582,800	476,600	193	202	241	133,090	117,984	114,814

Recently, poor crops of alfalfa seed together with poor seed crops of red clover have resulted in favorable prices for growers of alfalfa seed. Although converting from alfalfa hay to seed is easy and such change could shift sharply the supply and thus the price in a short time, probably the seed price will encourage a strong demand for at least one or two years.

Until now leaf-cutter bees have been used principally where alkali bees previously were used for pollination with relatively poor success. The alkali bee is strongly cyclical so that there are times when pollination by this insect may be quite disappointing. This problem can be alleviated or eliminated by using leaf-cutter bees. Several growers mentioned that they considered leaf-cutters as primarily "insurance".

The leaf-cutter bee has caused sizable increase in seed production in some areas where introduced as a management tool. Growers consistently report doubling or tripling seed crops when leaf-cuter bees pollinate. This indicates that considerable investment in bee culture and management can be justified by alfalfa-seed growers. Particularly, this is true in areas where other pollinators, such as alkali bees, are not available in adequate or consistent enough numbers to accomplish reliable pollination.

The center of bee culture and board marketing has been in the Boise Valley of Idaho. People from each of the other areas surveyed communicated with people from this area and knew its leading men in the field even though they did not know bee-keepers in other areas. Although California is the leading seed producing area, the greatest impact from leaf-cutter bees has occurred in the other parts of the West. Because Idaho is the largest area of production, has high yields, and is centrally located, it developed as the center of leaf-cutter bee industry. This gives southern Idaho unusual opportunity and responsibility.

The greatest volume of bee boards comes from the Boise Valley area. The majority of boards in use in each of the areas except southern Utah were from the Boise area. Five of the leading bee board producers in the Boise Valley consumed 950,000 board feet of lumber for bee boards in 1967. This probably constituted 250,000,000 holes. Based on 250 holes per board foot and $3 per 2,000 holes, $350,000 worth of drilled boards were sold or consumed by these five bee board producers.

Seed producers predicted that the demand for board in 1968 would double compared to 1967. This is based on a projected increase of pollination by the bees, retirement of boards presently in use, and elimination of soda straws as nesting material.

There were repeated references to the possibility of exporting bees in large quantities once the number of bees has been built to where there are excess bees in an area. Other regions of the United States and foreign countries have expressed interest in these insects. The natural conditions existing in the areas using bees in the Inland West make it possible that a sizable export business could be developed in the future.

The major concern of growers at present is parasitism. A number of parasites work in the boards and cause bee larvae mortality. This is the reason for seeking different types of board for nesting. Initially, boards were used like those most popular today. To reduce the loss caused by parasites, a grooved board was developed. These boards were layed up in laminates to form a unit of nest. The layers then could be opened and only the good "larvae" removed for returning to the field or marketing. Numerous growers reported increased parasitism with the laminated unit due to the parasite's ability to move through cracks between the laminations. Poor bindings and the size of opening between the laminates are responsible for part of this loss; but regardless of cause, most growers now avoid using laminated boards and use drilled boards. Some reported returning to drilled boards to reduce labor costs.

To reduce loss caused by parasitism in drilled boards, a plan of regular board replacement is used by most growers. These people usually replace the board every three years although several mentioned using it only one year. The board is a small part of the total cost, and if drilled boards remain desirable there will probably be a program of replacing boards on a two-year basis. Growers expect twenty percent of the good holes to be lost each year by parasitism and other causes. This means that a board used two years will be only 64 percent operative and likely contains parasites.

Until now, several different types of board have been tried. Efforts to duplicate nesting conditions with a plastic have failed. Plastics are more subject to bird damage and parasitism than wood while failing to simulate wood adequately. It is possible that a suitable plastic may be developed.

The various types of wood board may be classed as grooved, drilled, and push-out drilled. The grooved board and some reactions to it have been mentioned. There is considerable variation in this board which may explain its poor acceptance by growers. Possibly, the grooved board yet may be a good nesting material. The professional entomologists generally favor this board and feel it can be manipulated to reduce parasitism.

Drilled boards of two types are on the market. The simplest is that which has holes drilled and no further processing. This is the least expensive board and the one in widest use in the areas visited. The other type is drilled and then a board of about a half-inch thickness is sawn from the face and back. These make it possible to remove eggs from the board by pushing them out of the holes. This facilitates cleaning and permits sorting the good larvae from those which are parasitized. This board does not lose a part of its usefulness from additonal plugged holes after each year's service. It has the disadvantage of requiring more labor and added initial cost.

There has been considerable discussion regarding the best species of wood to use for the boards and a number of species have been used from time to time. These include Douglas-fir, cottonwood, sugar pine, western white pine, and ponderosa pine. There are proponents of different species but the hardwoods generally have been found unsatisfactory and harder textured softwoods more difficult to drill. The previously mentioned soft pines, sugar and western white and ponderosa, have similar characteristics. Each mills well, is quite easily drilled, has good dimensional stability when properly dried, is lightweight and generally is available in the area where the board is drilled.

Smooth holes are important. Rough holes may inhibit the bees entering, damage their wings, or cause them work and time to clean up the holes till they are satisfactory nesting sites. Time spent improving nests is lost for pollinating. Each of the soft pines is adequate in regard to smooth holes providing they have been properly seasoned before drilling and are properly drilled.

There has been considerable discussion of hole size. Some support exists for 1/4-inch diameter holes but generally the preferred sizes are 3/16-inch and 7/32-inch. Some manufacturers are placing holes of two sizes in a board anticipating that the smaller bees will utilize the smaller holes and larger bees will go to the larger ones. Some believe that the larger the hole the higher the female bee ratio, and because the female bees do the pollinating this could be important. On the other hand, some say it takes more work for the bee to make nests in the larger-holed boards so reduce their pollinating time. Since there is some support for 1/4-inch holes and none for 5/32-inch, which once were recommended, and entomologists generally think the bees are getting larger, the 7/32-inch hole probably will be preferred for marketing at present.

Depth of hole has been an issue in the past but there seems to be agreement that holes from three to four inches deep are best. Shallow holes reportedly have the disadvantage of a lower ratio of females. Deeper holes may be so deep the bees will not go clear to the bottom to build their first cell.

All the growers contacted felt a good standard size board would be six inches wide, four feet long, and approximately 3½-inches deep. These are handled easily and work well under most refrigeration arrangements without too many units to handle. This board will have approximately 2,000 holes in it.

There is some discussion of what quality board to use — select or high common type. Although some growers reportedly think a select quality board is required, none of those sampled felt so. Any board with tight knots, well seasoned to provide smooth drilled holes and seasoned so as to be free of checks which could harbor parasites should be acceptable. Frequently, growers found that holes near the knots, which apparently serve as an orientation point, filled first in boards.

Aging of the wood after drilling seems to be important. Several cases were cited of bees avoiding new boards in preference for aged boards. A number of growers reported buying boards in advance to allow for this aging. It is possible that the newly drilled board has a repelling influence caused by its resinous odor.

There appears to be an expanding market for boards to be used as nesting material for the leaf-cutter bee. Apparently this market will continue to expand for some time to come. Bad experience with grooved board forces recommending that anyone entering the business should work with drilled board while remaining aware of its potential replacement with a high quality grooved and laminated nesting unit. The availability of ponderosa pine in the area where the leaf-cutter bee is being used and its lower cost, make it advisable to give first consideration to this species. The producers of plank should remember the importance of good seasoning. A small investment in good seasoning pays well in better bee yields. Bee board plank producers and board drillers should give consideration to the bee's preference for aged board. Some artifical aging may be possible. In pricing as well as quality control, the bee board plank should be treated as a specialty item. The cost of good processing is a small part of total bee cost and should be invested. This added cost should be considered in pricing.

BEE SHELTERS

As part of this project, questions were posed regarding the possible market for a standardized field shelter for housing the bees. There was considerable interest among the growers.

A variety of bee shelters are used in the field. They vary from old refrigerators to small shelters, the latter containing only four of the four-foot bee boards, to large houses sixteen feet long and up to eight feet high. Some are wheel mounted, some skid mounted, some mounted on posts placed in the ground. Some were even designed for moving from the field by helicopter.

There is a tendency toward larger bee shelters. This does not necessarily mean they be fancy. Some suggested the simpler the better. A standardized house probably should be eight feet by four feet and at least ten inches deep. Some growers prefer boards and some plywood. While some wanted doors on the front to close in the bees, others thought an open front was adequate.

SOURCES OF LEAF-CUTTER BEE NESTING MATERIAL

Drilled

Geertson Mfg. & Sales
7311 Sunnybrook Dr.
Boise, Idaho

Dale Gilbert
Grandview, Idaho

Paul Jameson
Notus Machine Shop
Box 465
Notus, Idaho 83656

M. & R. Bee Board Co
Marsing, Idaho

Keller & Dickerson
Box 292
Parma, Idaho

Melvin Ezell
Marsing, Idaho

Joe Churruca
Rt. #1
Marsing, Idaho

Minidoka Seed Co.
Paul, Idaho

David Phelps
Rt. #1
Homedale, Idaho

Ray Meininger
Rt. #1
Marsing, Idaho

Chas. Weber
Rt. #1
Caldwell, Idaho

Leonard Tiegs
Rt. #2
Nampa, Idaho

A. C. Thomas
Rt. #4, Box 20
Moses Lake, Washington

J. C. Sandlin
S & S Cutter Boards
Zillah, Washington 98953

Removable Front & Back. Drilled Boards

Dority Bee Boards
Nyssa, Oregon

Grooved — Laminated

Val Barnes
Fillmore, Utah 84631

Cascade Wood Products
White City, Oregon

Valley Pollination Service
P.O. Box 608
Bakersfield, Calif. 93302