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# In-Field Chipping and Shredding of Almond Prunings as an Alternative to Burning

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**Objective: To determine the feasibility of in-field chipping/shredding as an alternative to burning of almond prunings.**

**Introduction:**
Most almond orchards are pruned each year in order to maintain tree vigor, prevent shading of interior wood, and maintain tree size. The brush is typically pushed out of the orchard and burned. Due to increasing concerns over air quality and the inconvenience of waiting for burn days, we are exploring the practice of in-field chipping or shredding of almond prunings as an alternative to burning. Although shredding is a common practice in vineyard and stonefruit farming systems, woody debris on almond orchard floors can be problematic. Almond hulls are sold to dairies for feed and represent significant income for hullermen. Debris that is picked up with the nuts at harvest and not separated from the hulls during the hulling process will increase hull crude fiber content. Hulls containing more than 15% crude fiber are significantly less valuable. Wood debris large enough to be separated at the huller is considered to be industrial waste and must be disposed appropriately.

In 1996, a trial was established at Hopeton Farms in Snelling (cvs. 'Butte' & 'Padre' irrigated with solid set sprinklers) to compare "chipping" which produces small, angular pieces with smooth sides and sharp edges verses "shredding" which results in a longer, thinner, frayed product. In this trial, woody debris in windrows, nut carts, and hull piles was monitored in rows where brush was chipped with a Brush Bandit® chipper, shredded with a tractor-mounted Rears® shredder, or pushed out of the orchard and burned. In 1997, a self-powered, high horse-power, custom shredding machine built by Bert Walters was added to the trial. The trial was conducted in two blocks with different vegetation management strategies; a planted and managed cover crop verses the native vegetation with closer and more frequent mowing.

In 1998, a second trial was initiated in Stanislaus County to determine the feasibility of shredding in a microsprinkler-irrigated orchard. In this trial, two, three, or four passes with a tractor-mounted Rears shredder was compared to removing brush from the orchard and burning it. In both trials, shredded debris was collected and separated into particle size categories to determine the fate of differing sizes of woody debris. A third chipping trial was initiated in 1999 to examine the use of nitrogen fertilizer and other materials to increase the rate of debris decomposition.

Each fall after trees were pruned the brush was chipped or shredded. The following year, samples were collected at harvest from windrows, nut carts and hull piles. Woody material was separated from nuts, hulls and other debris and segregated into size categories. Samples were rated as percent woody debris. In addition, hull pile samples were submitted to an analytical lab for crude fiber determinations.

**Results:**
In the Hopeton trial, shredding with the Rears® shredder (one pass) and chipping resulted in significant increases in woody material in the finished hull product in all three years (Figure 1).

Areas with "chipped" prunings had the highest percent wood in windrows, nut carts, and hull piles. Woody debris in rows shredded with Bert Walter's self-powered shredder was similar to rows where brush was pushed out and burned. In general, there was less woody debris each year in the native vegetation block than the planted and managed cover crop, presumably due to additional fragmentation from closer and more frequent mowing.

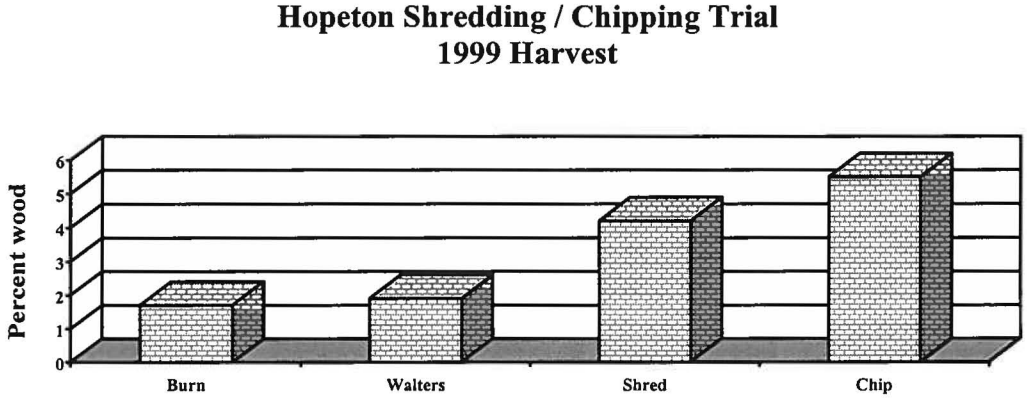


*Fig. 1 Percent wood in hull piles from rows where brush was pushed out and burned, shredded with Burt Walter's custom shredder, shredded with a tractor-mounted Rears® shredder or chipped.*

In the Keyes Ranch trial where brush was shredded two, three, or four times, particle size decreased as the number of passes increased (Figure 2). In turn, the amount of woody debris remaining in windrows and nut carts decreased as the number of passes increased (Figure 3). However, rows where brush was removed and burned still had lower levels of woody debris than shredded rows.

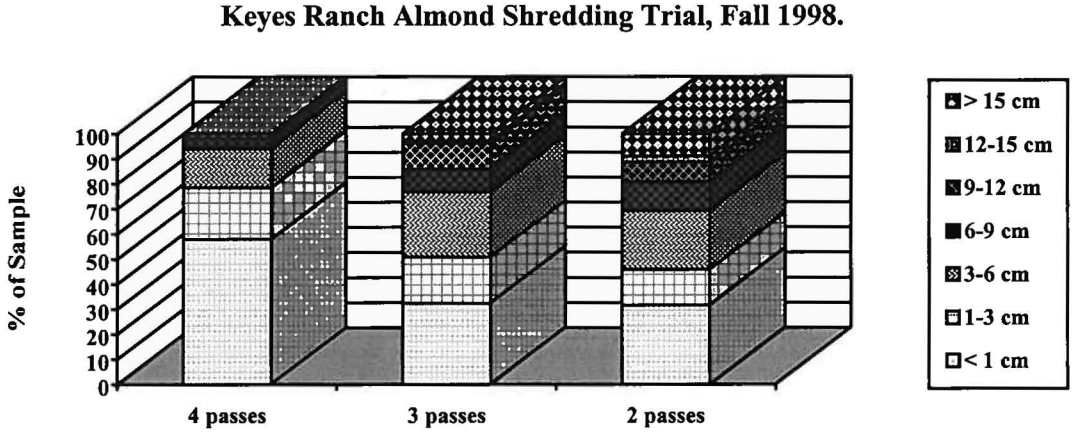


*Fig. 2.. Particle size after two, three, or four passes with a tractor-mounted Rears® shredder.*

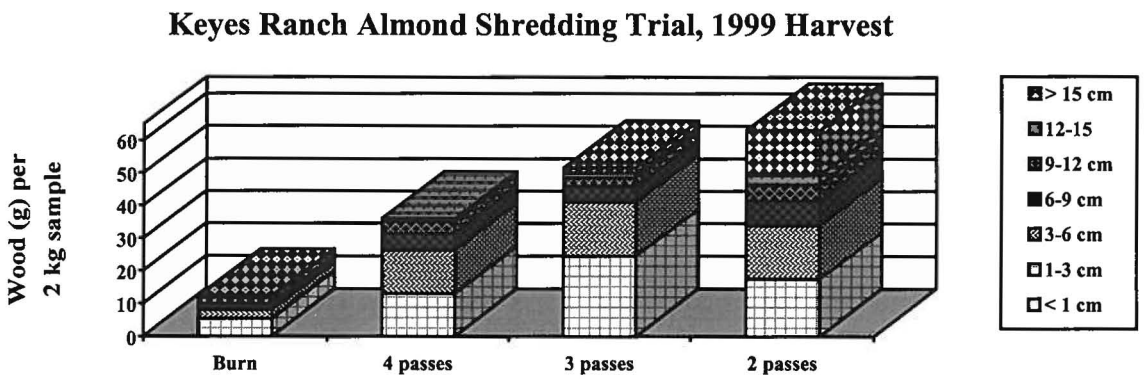


*Fig. 3. Woody debris in nut carts from rows where two, three, or four passes of a tractor-mounted Rears® shredder was compared to burning to dispose of almond brush.*

Debris under 1 cm in length was essentially removed during the harvesting process. Most debris over 9 cm (3.5 inches) was separated during the hulling process. Regardless of the method of brush disposal, particles from 1-9 cm in length proved to be most problematic because they were not separated and tended to accumulate in the hull pile (Figure 4). Despite higher levels of woody debris in windrows and nut carts, there was no clear increase in the final hull pile product.

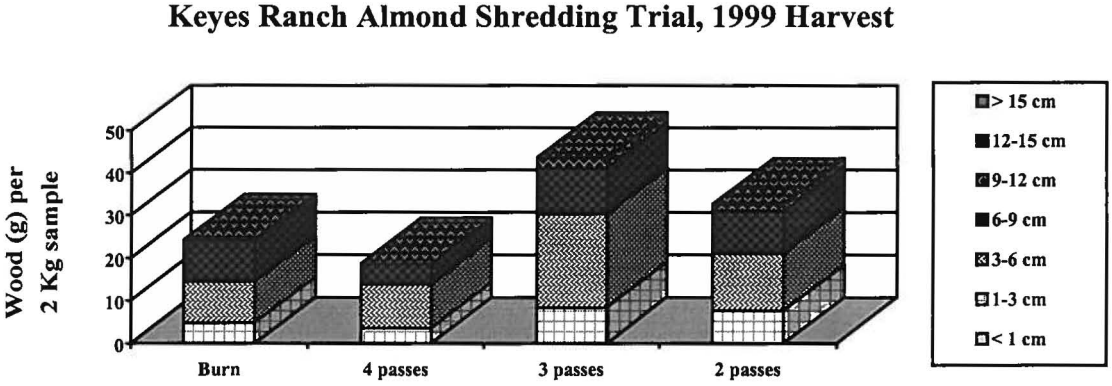


*Fig. 4. Hull pile woody debris from rows where two, three, or four passes of a tractor-mounted Rears® shredder was compared to burning to dispose of almond prunings*

**Discussion:**

It appears possible to shred almond brush in the field and obtain acceptable levels of woody residue at harvest. However, multiple passes with a tractor-mounted brush shredder is necessary. In our estimation, each pass with a tractor and shredder costs approximately $10 per acre compared to approximately $7 per acre to push brush out and burn it. It is possible the addition of nitrogen or another material may increase the rate of decomposition and therefore reduce the need for multiple passes. However, applying large quantities of nitrogen fertilizer after harvest raises environmental questions. Although wood over 9 cm in length is usually removed during the hulling process, this increases the burden and expense to hullermen. Shredding limbs and returning organic matter to the soil may arguably have some agronomic value, but it is difficult to economically justify shredding almond brush with current technology while burning is allowed.