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Development of 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:

Almond orchards are typically pruned annually to maintain tree vigor, prevent shading of interior wood, and maintain tree size. The brush is usually pushed out of the orchard and burned. However, there are increasing concerns about air quality and tighter regulations over agricultural burning. Some almond growers are shredding the prunings in the field, but foreign material on the orchard floor is collected with the nuts during mechanical harvest, leading to problems at the huller. Excessive woody material is difficult to separate from the hulls. Almond hulls are sold to dairies as a feed supplement and excessive fiber reduces their value. It is difficult and expensive to dispose of brush and other orchard debris that has been separated from the nut delivery at the huller.

In 1996, a pilot test was established at Hopeton Farms in Snelling using 'Butte' with solid-set sprinklers to develop shredding and chipping techniques as an alternative to burning of almond prunings. The trial tested a Brush Bandit® chipper and a Rears® shredder against the typical practice of pushing the brush out of the orchard and burning it. In 1997, a custom made, self-powered shredding machine by Bert Walters was added to the trial. The trial is being conducted in two blocks with different vegetation management strategies; a planted legume mix cover crop which is mowed only after seed is set in May verses the native vegetation with more frequent mowing. Prunings were chipped or shredded in the falls of 1996-1998. Brush weights were taken in 1997 and 1998. At harvest, samples were collected from the windrows and the nut carts to calculate the amount of pruning waste in each treatment. Each treatment was processed separately by Lake Shelling and the final hull products were again sampled. Final hull products were submitted to an analytical lab in 1998 to determine total crude fiber and acid digestible fiber content.

A second trial was established in 1998 at Green Valley Ranch to test the number of passes with a Rears® shredder required to reduce particle size to an acceptable level. This second trial is in a micro-sprinkler irrigated Nonpareil:Carmel orchard. Harvest samples will be evaluated in this orchard in 1999.

Results:
Chipping and shredding in 1997 resulted in a significant increase in woody material in the finished hull product. In 1998 the woody residue levels in the chipped and shredded areas were similar to levels in 1997 from the **windrows** and **nut carts.** However, nut cart samples of woody material were much higher in 1998 than 1997 in areas where brush was pushed out of the orchard and burned. The reason for this is unclear and lessened the differences between treatments.

Hull pile wood content was very low in the 1998 push and burn and in the Walters treatments. Overall the wood in the hull piles was only 1/3 to ½ of the amount in 1997. Wood content in the shredded and in the chipped treatments in the native cover are low to moderate. Wood content in the shredded and in the chipped treatments with planted legume cover are moderate, but lower than 1997.

Hull pile fiber content was very similar for chipped, shredded, and burned brush in 1998. The results were better for all brush treatments in the native vegetation block than in the block with a planted and late-mowed leguminous cover crop. This is probably due to the more frequent mowing in the native block during the season resulting in increased destruction of the woody material.

Conclusions:
Two years of data show that very small amounts of wood are left in the hulls where brush is pushed and burned. However, one year of data indicates that residues following treatment with the Bert Walters machine are very similar to the residues from the push and burn treatment. Both chipping and shredding with the standard shredder can leave objectionable residues in the hulls, but the more frequent mowing in the native cover will reduce this residue. Brush residue is pulverized with in-season mowing and increased numbers of mowings results in less woody residue at harvest. This trial will continue for one more year.

Table 1. Percent of wood fragments at several stages of harvest

	WINDROWS		NUT CARTS		HULL PILES	
Treatment	1997	1998	1997	1998	1997	1998
Burned-Planted Cover	1.8%	0.2%	0.9%	2.4%	1.1%	0.6%
Walters-Planted Cover	-	3.2%	-	1.0%	-	0.9%
Shredded-Planted Cover	7.4%	6.5%	6.2%	6.1%	7.7%	2.4%
Chipped-Planted Cover	10.2%	7.7%	5.5%	4.6%	6.7%	2.8%
Burned-Native Cover	1.1%	0.2%	0.4%	2.5%	0.8%	0.9%
Walters-Native Cover	-	0.8%	-	1.9%	-	0.8%
Shredded-Native Cover	4.1%	2.4%	2.9%	2.6%	4.1%	1.8%
Chipped-Native Cover	6.7%	3.6%	4.7%	3.0%	6.3%	1.7%

Table 2. Hull Fiber Summary by field

Planted Cover Crop	Percentage Crude Fiber	Percentage Acid Digestible Fiber
Burned	26.8	40.6
Walters shredder	27.8	36.0

Shredded by Rears	24.9	37.6
Chipped by Brush Bandit	26.1	35.6
Native Cover Crop		
Burned	22.1	31.1
Walters shredder	19.7	30.2
Shredded by Rears	20.9	29.5
Chipped by Brush Bandit	23.2	30.4

FIGURE 1. PERCENT WOOD IN HULLS 1998