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REDUCED WHEEL TRAFFIC COULD BOOST ALFALFA GROWER INCOMES

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California experiments reported in the 1974, 1976 and 1977 California Alfalfa Symposium Proceedings indicate that wheel traffic in alfalfa hay fields is responsible for severe reductions in hay yield and stand life. Wheel traffic on sandy or medium texture soils also limits the development of alfalfa roots by compaction. Mechanical damage to alfalfa plant crowns and regrowth shoots in treatments simulating baler, cuber or bale wagon traffic resulted in reduced plant vigor and yield. Plants growing on light-textured soil with small root systems at the time of first harvest will be generally weakened and many will not survive the double blow of root-inhibiting soil compaction and mechanical damage to regrowth.

Some minor modifications in existing wheel traffic patterns in California alfalfa fields could result in about \$102 million in increased annual income for hay growers in this state.¹ The proposed modifications would include minor adjustments in equipment configuration and wheel locations on the swather, rake, baler and bale wagon. Figure 1 shows wheel locations which are typical of harvest equipment used in California hay fields in 1982, and Figure 2 shows suggested modifications using wheel base standards of 76" and 92".

The purpose of these modifications is to minimize the area in alfalfa fields used for wheel traffic, thus causing damage to fewer alfalfa plants. Warm climatic areas which have frequent alfalfa harvests are expected to gain the most as a result of the equipment modifications suggested here because of mechanical damage to regrowth shoots by post-harvest equipment wheels. Permanent traffic lanes would result from aligning wheels of all equipment to trail on centers that would minimize the area of wheel contact. Shallow furrows could be established to mark the traffic lanes during stand establishment. These furrows would force equipment drivers to follow the proper traffic lanes and result in a consistent field traffic pattern.

Increased yields and longer stand life account for the sizable monetary savings anticipated from this change in wheel alignment for hay harvest equipment. Equipment wheels presently cover up to 70% of the area in California alfalfa fields during each harvest. This could be reduced to 20% of the area by the modifications being proposed, with only 10% of the area affected by post-harvest traffic on regrowth buds.

Previous studies² have demonstrated significant effects of wheel traffic on relatively small plots of alfalfa. There is a need now for financial assistance to conduct a substantial field test under commercial field conditions over a three or four year period to obtain economic data related to potential increases in yield and stand longevity.

¹The basis for calculation of estimated savings for California alfalfa growers is listed on Reference Sheet "A".

²California Agriculture, Vol. (10) 28; pg. 6-8, "Influence of Wheel Traffic on Yield and Stand Longevity of Alfalfa," 1974, W. R. Sheesley, D. W. Grimes, et al, and

1976 California Plant and Soil Conference Proceedings, American Society of Agronomy, California Chapter, Grimes, Sheesley, and W. D. McClellan.

Agronomy Journal, Vol. 70 Nov.-Dec. 1978; p. 955-958, "Alfalfa Root Development and Shoot Regrowth in Compact Soil of Wheel Traffic Patterns," D. W. Grimes, W. R. Sheesley and P. L. Wiley.

American Society of Agricultural Engineers 1977 Winter Meeting, paper #77-1513, "Reduced Wheel Traffic Could Boost Alfalfa Grower Incomes", Sheesley and Grimes.

The Effect of Harvest Traffic on Alfalfa Yield, paper R-150, University of Nevada E. H. Jensen, et al., February 1982.

*ESTIMATED INCREASE IN GROSS INCOME FROM MODIFIED WHEEL TRAFFIC

- Calculations -

	<u>Width</u>	<u>% of Area</u>	<u>Production %</u>	<u>Estimated Tons/Acre</u>	<u>Adj. Production</u>
A. Normal Traffic (bale wagon traveling same direction as baler)					
No traffic	138.0"	41	100	9.0	3.69
Light traffic	86.5"	26	90	8.1	2.11
Moderate traffic	91.5"	27	45	4.1	1.11
Heavy traffic	20.0"	6	27	2.4	.14
Totals	336.0"	100	--	-	7.05 tons/acre
B. Normal Traffic (bale wagon traveling opposite baler)					
No traffic	167.0"	50	100	9.0	4.50
Light traffic	81.5"	24	90	8.1	1.94
Moderate traffic	59.0"	18	45	4.1	.74
Heavy traffic	28.5"	8	27	2.4	.19
Totals	336.0"	100	-	-	7.37 tons/acre
C. Modified Traffic					
No traffic	288.0"	86	100	9.0	7.74
Light traffic	24.0"	7	90	8.1	.57
Heavy traffic	24.0"	7	27	2.4	.17
Totals	336.0"	100	-	-	8.48 tons/acre

1. Potential increase in yield from A to C: $8.48 - 7.05 = 1.43$ tons/acre or 20.3%

2. Potential increase in yield from B to C: $8.48 - 7.37 = 1.11$ tons/acre or 15.1%

3. The expected annual increased income from improved yields in California would be approximately \$87,040,000 per year. This estimate is based on \$85 per ton value on 1,024,000 tons increased yield. The tonnage figure was developed as follows:

$$900,000 \text{ acres} \times 1.11 \text{ tons increase} + 100,000 \text{ acres} \times .25 \text{ tons increase}$$

4. Benefit from extended stand life (3 years increased to 4 years for 800,000 acres and 4 years increased to 5 years stand life for 200,000 acres)

Planting costs - \$200 per acre

3 year stand cost = \$67 per acre per year

4 year stand cost = \$50 per acre per year

5 year stand cost = \$40 per acre per year

Savings (California alone) = $\$17 \times 800,000$ acres (non-dormant alfalfas) = \$13,600,000 annually

$\$10 \times 200,000$ acres (semi-dormant alfalfas) = \$2,000,000

Total savings from stand life increase \$15,600,000 annually

5. Estimate of total increased annual income for California growers on 1,000,000 acres \$102,640,000

*These calculations apply to 900,000 acres of alfalfa hay in California. An additional 100,000 acres in the far northern part of California would be expected to profit by about 1/4 tons/acre instead of 1.11 tons/acre increased yield. These estimates may be conservative since 1,140,000 acres of alfalfa were grown in California in 1977 and 1,050,000 acres in 1981.

Standard Equip. Wheel Traffic

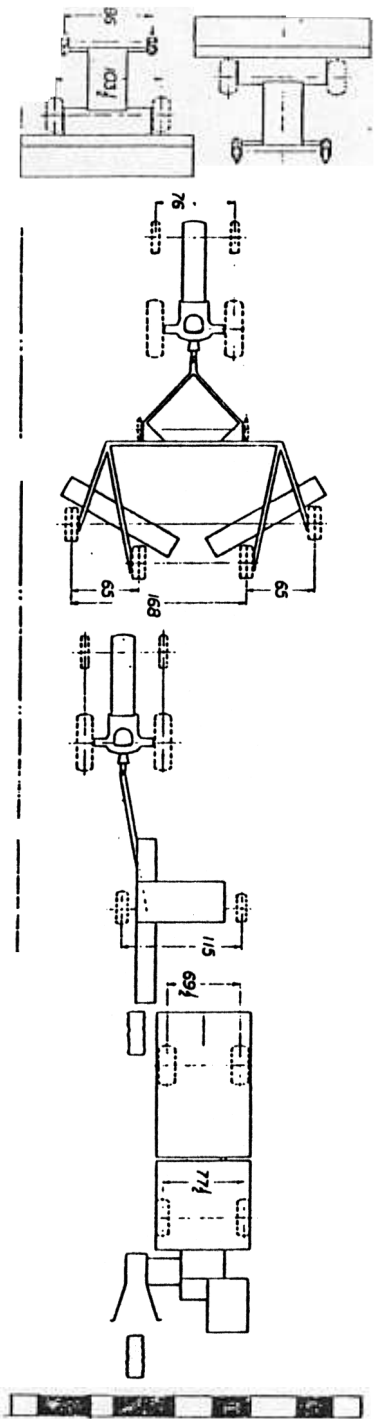


Figure 1

Modified Equip. for Minimum Wheel Traffic

SWATHER

RAKE

BALER

BALE WAGON

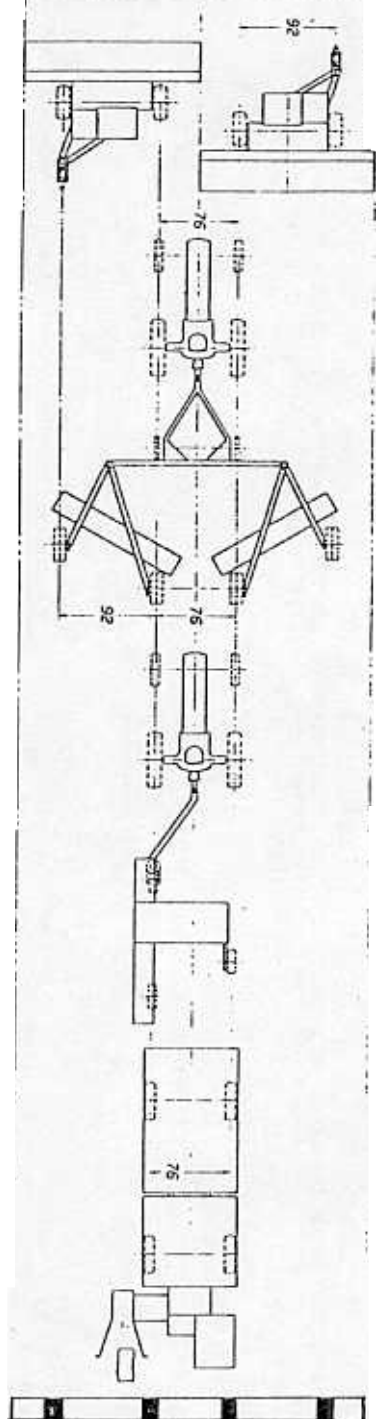


Figure 2