# CDFA Memo: Rat Damage in Almond Orchards

Rachael E. Goodhue, Kevi Mace-Hill, and Samuel Raburn

University of California, Davis

California Department of Food and Agriculture

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In fall 2024, California almond growers in the western Central Valley experienced severe rat infestations in orchards and farm facilities. Over 112,000 acres covering hundreds of operations are thought to have been affected. This memo provides a preliminary estimate of damages from a year of infestation. This estimate includes the following: yield loss from being unable to water post-harvest, yield loss from direct damage to trees, cleaning and repairing wires for trucks and harvesters, drip line replacement, and tree replacement. We calculate the damages in those areas to be $109.4 million to $310.5 million.

The California Department of Food and Agriculture (CDFA) conducted a rodent survey in response to requests for assistance with high rat populations. The survey used standard rodent trapping protocols and recorded 0-32 rats per night per inspection site. The survey provided information to map the areas impacted by rat infestations. We used this map to estimate the number of impacted almond acres.

Based on personal communications with multiple industry members, the following production costs are considered: repairing tractors damaged by gnawed wires, repairing harvesters damaged by gnawed wires, cleaning rat droppings from equipment, repairing gnawed drip irrigation lines, and replacing trees. These are likely not inclusive of all damage costs. The costs for cleaning rat droppings (wage rate) and replacing trees were taken from a 2024

UC Davis cost study on almonds (University of California Cooperative Extension, 2024) while the cost for replacing drip line irrigation was taken from a 2019 UC Davis cost study on almonds (University of California Cooperative Extension, 2019). This is the most recent cost study for almonds to include a price for drip line. CDFA has reached out for industry quotes on drip line replacement but has not heard back. Estimates of the other costs were obtained from industry members.

Two sources of yield loss are included: no irrigation post-harvest and direct damage to trees, which both affect yield the following year. Losses due to reduced yields are a significant driver of the cost of rat infestations. In this analysis, we only consider future yield loss. Although yield loss from lack of preharvest irrigation may have occurred, CDFA reports only indicated complications from growers not being able to water post-harvest. Table 1 summarizes the analysis. Table 2 details the underlying parameter values and sources.

Table 1: Estimated Costs Due to Rat Infestations

| **Item** | **Minimum Cost** | **Maximum Cost** |
|---|---|---|
| Tractor Repair | $60,000 | $180,000 |
| Harvester Repair | $10,800 | $32,400 |
| Cleaning Rodent Droppings from Equipment | $1,321 | $3,964 |
| Drip Line Replacement | $56,071,500 | $168,214,500 |
| Tree Replacement | $4,399,370 | $4,399,370 |
| Yield Loss Next Season (No Water Post-Harvest) | $42,985,398 | $128,956,196 |
| Yield Loss (Direct Damage) | $5,840,407 | $8,760,611 |
| **Total Estimated Costs** | **$109,401,197** | **$310,547,041** |

All costs were not borne by all affected acres. We provide low and high estimates of costs to capture the potential range of impact. The lower bound estimate uses the following assumptions: 25% of acres had to replace drip lines, 20% acres were unable to water post-harvest, 10% of trees per acre had direct damage leading to 20% yield reduction for those trees, 5% of tractors were damaged, 5% of harvesters were damaged, cleaning was done on

42 vehicles, and one tree per acre was replaced. The upper bound estimate uses the following assumptions: 75% of acres had to replace drip lines, 60% acres were unable to water post-harvest, 15% of trees per acre had direct damage leading to 20% yield reduction for those trees, 15% of tractors were damaged, 15% of harvesters were damaged, cleaning was done on 126 vehicles, and one tree per acre was replaced. Details of these parameters are provided in Table 2. Estimates of scenarios that use a combination of assumptions (i.e., lower yield losses but higher drip tape replacement) are possible using the information in Table 2.

Caveats: This report is meant to provide preliminary estimates of likely impacts based on CDFA's rodent survey, communications with industry, and information on costs. Changing our assumptions about the percent of acres or equipment affected for any of the variables would change the results. It is unlikely that the included costs are inclusive of all damage sustained. In particular, this likely does not fully capture the impact of direct damage to trees, especially to newly planted orchards. We also did not include postharvest costs, only on-farm costs. Yield losses from lack of postharvest water may not be as high as estimated by Goldhamer and Viveros (2000) if growers managed to get alternate irrigation in place rapidly. We may update these estimates as more information becomes available.

Table 2: Parameter Values and Sources

| Cost | Parameter | Source |
|---|---|---|
| Almond Acreage | 112,143 Affected Acres | CDFA |
| Almond Price | $2,741/ton | CDFA (2023) |
| Tractor Repair | 1 Tractor per 400 Acres;<br>5-15% affected;<br>$4,000 per tractor affected. | Communication with Industry |
| Harvester Repair | 1 Harvester per 1,000 acres;<br>5-15% affected;<br>$1,800 per harvester affected. | Communication with Industry |
| Cleaning Rat Droppings from Equipment | 1 hr of labor per machine affected;<br>Machines affected = 2x vehicles needing repair;<br>$31.46 per labor-hour. | UCCE (2024) |
| Drip Line Replacement | 25% - 75% of acres affected;<br>$2,000 per acre affected. | UCCE (2019) |
| Tree Replacement | 1 tree per acre affected;<br>$39 per replacement tree. | UCCE (2024) |
| Yield Loss Next Season (No Water Post-Harvest) | If water is restricted post-harvest, yields for the following season are reduced by 73.6%;<br>20-60% of acres affected. | Goldhamer and Viveros (2000) |
| Yield Loss (Direct Damage) | 10-15% of trees affected;<br>20% yield loss per affected tree. | Communication with Industry |

# References


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