

CDFA Memo: Rat Damage in Almond Orchards – Updated 2026

Kevi Mace, Office of Pesticide Consultation and Analysis

Yanan Zheng, University of California, Davis

Rachael Goodhue, University of California, Davis

February 2026

In fall 2024, California almond and pistachio growers in the western Central Valley experienced severe rat infestations in orchards and farm facilities. According to the California Department of Food and Agriculture’s (CDFA) 2024 trapping survey, over 112,000 acres of almond and 116,000 acres of pistachio covering hundreds of operations were affected, that was the equivalent to 36.4% and 69.6% of Fresno County’s harvested acreage in 2024, respectively (County of Fresno, 2025). The large majority of the surveyed acres were in Fresno County with smaller areas in Kings and Merced Counties. This memo provides an updated estimate of damages from a year of infestation in only the area surveyed by CDFA in 2024. An earlier memo provided an estimate just for almond (https://www.cdfa.ca.gov/oars/opca/docs/Preliminary_analysis_of_rat_damage_in_almonds_2025_0211.pdf). This memo adds pistachio and updates the cost assumptions used for almond to reflect more information.

This updated estimate includes the following for almond and pistachio in the originally defined infested area surveyed by CDFA: 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. All costs were not borne by all affected acres for either crop. Pistachio has not experienced increased damage to drip lines, likely due to differences in irrigation schedules – pistachio does not have a dry down period before harvest like almond. We provide low and high estimates of costs to capture the potential range of financial impacts. Details of the assumptions for each estimate are provided below. We calculate the damages in those areas to be \$188.0 million to \$297.7 million for almond. For purposes of comparison, that is equivalent to 13.3% to 21.1% of the value of Fresno County’s 2024 almond production. For pistachio, annual costs range from \$48.1 million to \$275.5 million (5.6% to 32.1% of Fresno’s production value). Accounting for a total of five years of yield loss, including the current and future years, total estimated costs range from \$53.1 million to \$300.3 million, or 6.2% to 35.0% of Fresno’s production value (County of Fresno, 2025).

In 2024 CDFA conducted a rodent survey in response to requests for assistance with high rat populations. The 2024 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 industry members, we considered the following production costs: 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 almond (University of California Cooperative Extension (UCCE), 2024) while the cost for replacing drip line irrigation was taken from a 2019 UC Davis cost study on almond (University of California Cooperative Extension, 2019). This is the most recent cost study for almond to include a price for drip line. CDFA has reached out for industry quotes on drip line replacement but has not received any responses. CDFA obtained estimates of the other costs from industry members.

Two sources of yield loss are included for almond: 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 pre-harvest irrigation may have occurred, CDFA reports only indicated complications from growers not being able to water post-harvest. Table 1 summarizes the analysis. Table 3 details the underlying parameter values and sources.

Table 1: Estimated Annual Costs Due to Rat Infestations: Almond

	Minimum Cost	Maximum Cost
Almond		
Increased Pest Management Cost	\$44,857,200	\$67,285,800
Tractor Repair	\$60,000	\$172,000
Harvester Repair	\$10,800	\$30,600
Cleaning Rodent Droppings from Equipment	\$1,321	\$3,964
Drip Line Replacement	\$112,143,000	\$168,214,500
Tree Replacement	\$8,747,154	\$8,747,154
Yield Loss Next Season (No Water Post-Harvest)	\$2,422,963	\$12,114,817
Yield Loss (Direct Damage)	\$19,752,419	\$41,150,874
Total Estimated Costs	\$187,994,858	\$297,719,709

For pistachio, two sets of analyses are considered: annual yield reductions due to direct damage to trees, and cumulative yield reductions over the next five years due to the original damage, including the current year. Table 2 reports the estimated costs, and Table 4 details the underlying parameter values and sources.

Table 2: Estimated Costs Due to Rat Infestations: Pistachio

	Minimum Cost	Maximum Cost
Increased Pest Management Cost	\$46,570,000	\$267,777,500
Tractor Repair	\$60,000	\$176,000
Harvester Repair	\$10,800	\$32,400
Cleaning Rodent Droppings from Equipment	\$1,321	\$3,964
Yield Loss, Current	\$1,499,554	\$7,497,770
Yield Loss, Current and Future (5 years)*	\$6,466,267	\$32,331,335
Total Estimated Costs, Current	\$48,141,675	\$275,487,634
Total Estimated Costs, Current and Future (5 years)*	\$53,108,388	\$300,321,199

* An 8% deflation rate is used to convert future costs to current values.

All costs were not borne by all affected acres for either crop. We provide low and high estimates of costs to capture the potential range of impact. For almond, the lower bound estimate uses the following assumptions: per-acre pest management cost increased by \$400, 50% of acres had to replace drip lines, 1% acres were unable to water post-harvest, 20% of trees per acre had direct damage leading to 30% yield reduction for those trees, 5% of tractors were damaged, 5% of harvesters were damaged, cleaning was done on 42 vehicles, and 2 trees per acre were replaced. The upper bound estimate uses the following assumptions: per-acre pest management cost increased by \$600, 75% of acres had to replace drip lines, 5% acres were unable to water post-harvest, 25% of trees per acre had direct damage leading to 50% yield reduction for those trees, 15% of tractors were damaged, 15% of harvesters were damaged, cleaning was done on 126 vehicles, and 2 trees per acre were replaced. Details of these parameters are provided in Table 3. 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 3.

Table 3: Parameter Values and Sources: Almond

Cost	Parameter	Source
Almond Acreage	112,143 Affected Acres	CDFA
Almond Yield	0.90 tons/acre	CDFA (2024)
Almond Price	\$3,280/ton	CDFA (2024)
Increased Pest Management Cost	\$400 per Acre	\$600 per Acre
Tractor Repair	1 Tractor per 400 Acres; 5–15% affected; \$4,000 per tractor affected.	Communication with Industry
Harvester Repair	1 Harvester per 1,000 acres; 5–15% affected; \$1,800 per harvester affected.	Communication with Industry

Cleaning Rat Droppings from Equipment	1 hr of labor per machine affected; Machines affected = 2x vehicles needing repair; \$31.46 per labor-hour.	UCCE (2024)
Drip Line Replacement	50% –75% of acres affected; \$2,000 per acre affected.	UCCE (2019)
Tree Replacement	2 trees per acre affected; \$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%; 1–5% of acres affected.	Goldhamer and Viveros (2000)
Yield Loss (Direct Damage)	30–50% of trees affected; 20–25% yield loss per affected tree.	Communication with Industry

For pistachio, the lower bound estimate uses the following assumptions: per-acre pest management cost increased by \$400, 2% of trees per acre had direct damage leading to 10% yield reduction for those trees, 5% of tractors were damaged, 5% of harvesters were damaged, and cleaning was done on 42 vehicles. The upper bound estimate uses the following assumptions: per-acre pest management cost increased by \$2,300, 5% 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, and cleaning was done on 126 vehicles. The upper bound estimate for pest management in pistachio is likely driven several factors specific to pistachio. One, net returns were higher for pistachio in 2024. And two, pistachio orchards can produce economically for over 100 years. Protecting the trees pays off for decades. Details of these parameters are provided in Table 4.

Table 4: Parameter Values and Sources: Pistachio

Cost	Parameter	Source
Pistachio Acreage	116,425 Affected Acres	CDFA
Pistachio Yield	1.61 tons/acre	CDFA (2024)
Pistachio Price	\$4,000/ton	CDFA (2024)
Increased Pest Management Cost	\$400–2,300 per Acre	Communication with Industry
Tractor Repair	1 Tractor per 400 Acres; 5–15% affected; \$4,000 per tractor affected.	Communication with Industry
Harvester Repair	1 Harvester per 1,000 acres; 5–15% affected; \$1,800 per harvester affected.	Communication with Industry
	1 hr of labor per machine affected;	UCCE (2024)

Cleaning Rat Droppings from Equipment	Machines affected = 2x vehicles needing repair; \$31.46 per labor-hour.	
Yield Loss Current and Future (5 years)	2–5% of trees affected; 10–20% yield loss per affected tree.	Communication with Industry

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 post-harvest costs, only on-farm costs. Almond yield losses from lack of post-harvest 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.

References

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