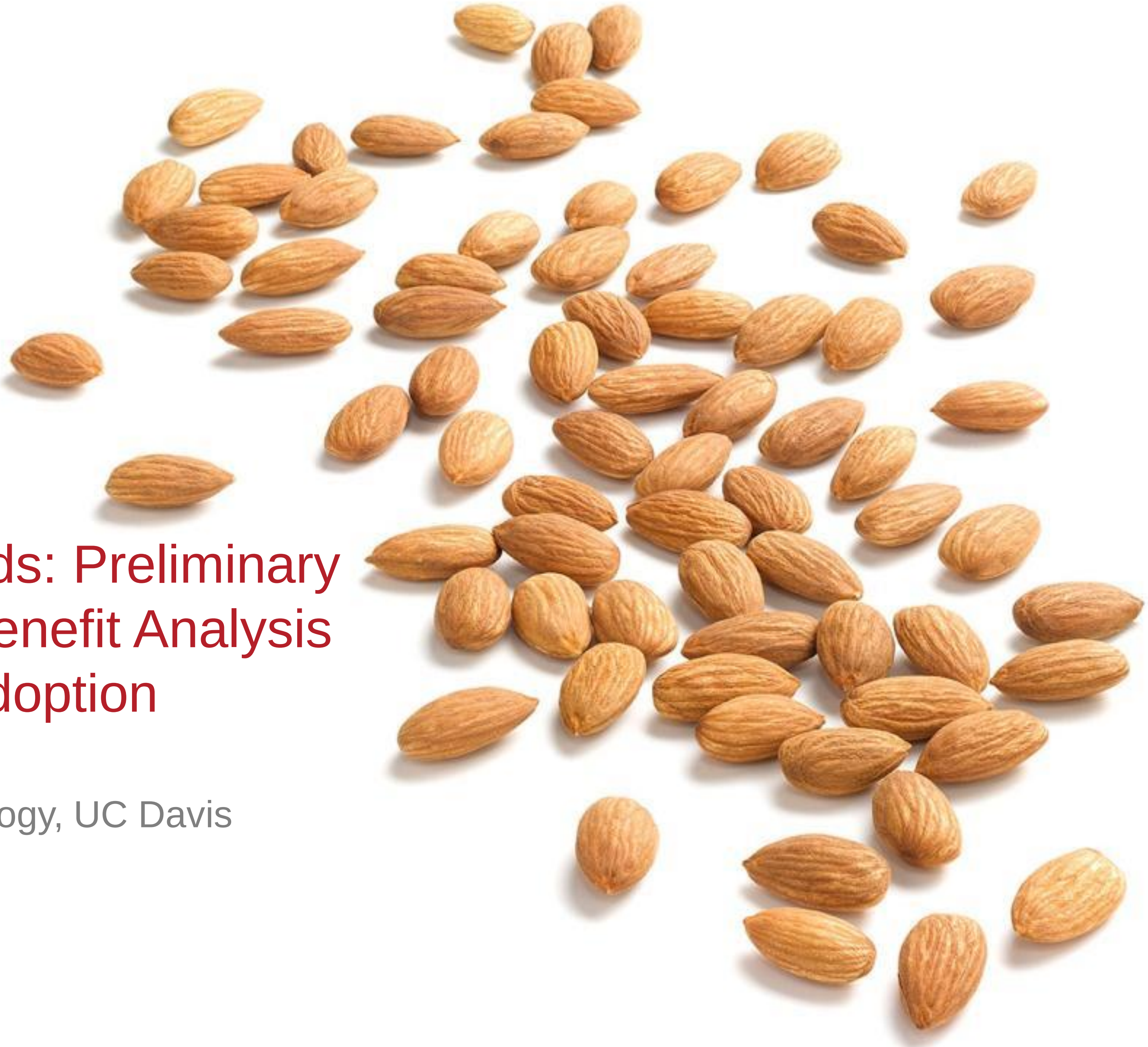


Off-ground Harvest of Almonds: Preliminary Technoeconomic Cost and Benefit Analysis with Analysis of Barriers to Adoption

Christopher Simmons
Department of Food Science and Technology, UC Davis

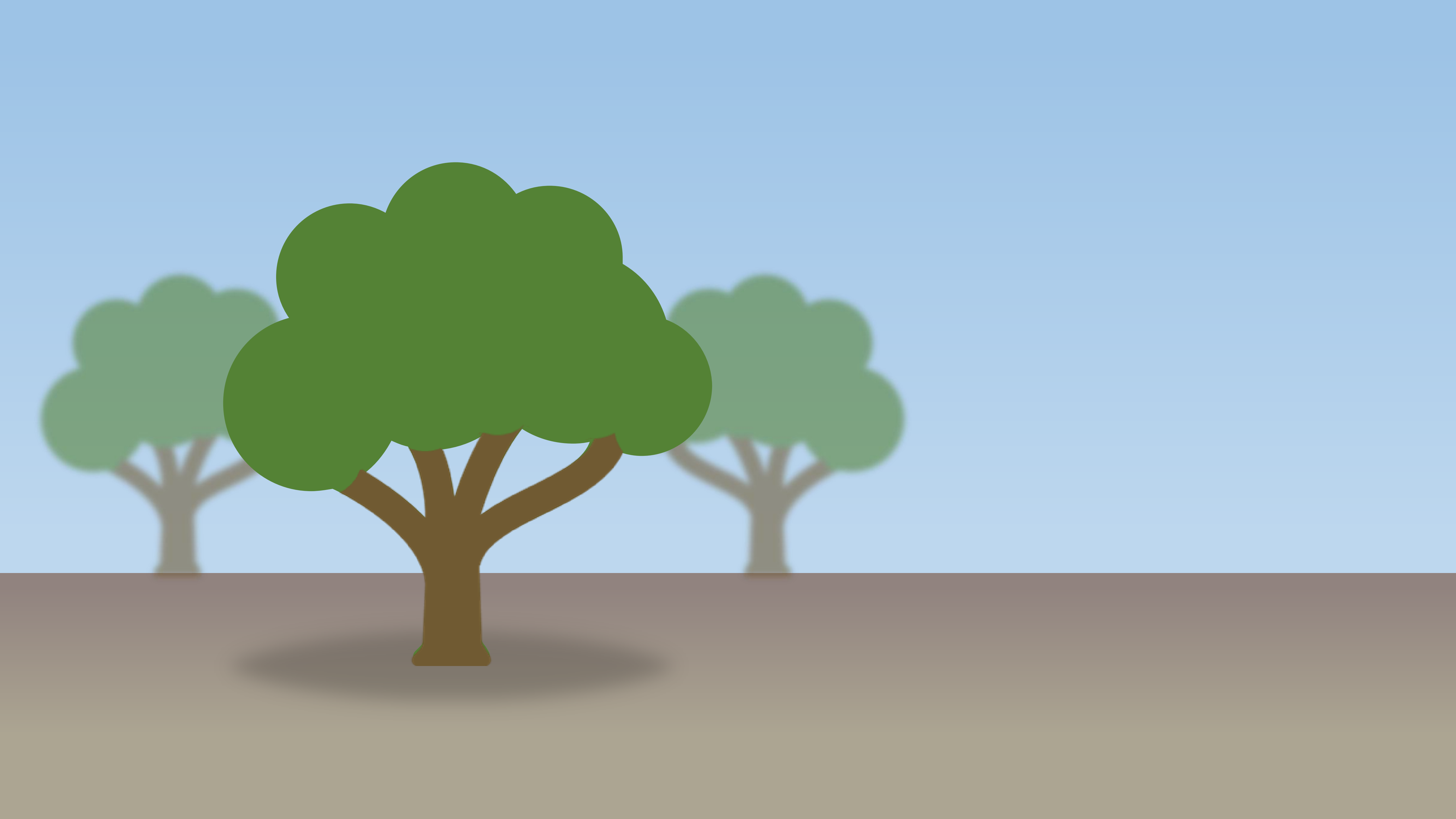
california almonds
Almond Board of California

Goals

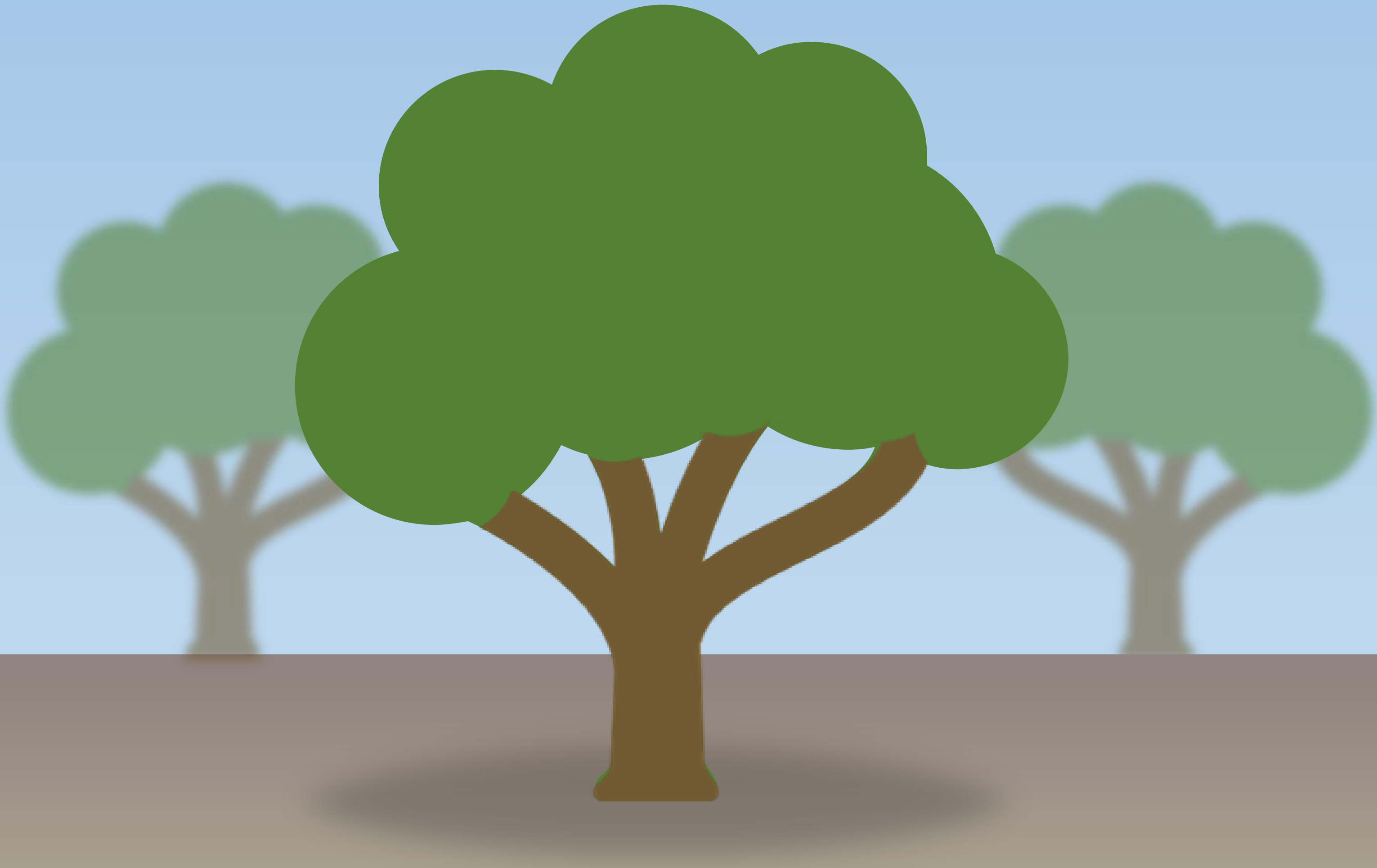
Understand the economic opportunities and risks associated with potential off-ground harvesting approaches compared to conventional methods.

Goals

- Inform **decision making** on off-ground harvest strategy
- Highlight **technological aspects** of off-ground harvest that are cost drivers and warrant **research to reduce cost**
- Identify **goods and services** that are **cost drivers** for off-ground harvest to gauge effect of price volatility
- Identify **cost drivers** for off-ground harvest that could be targets for **new policies and incentives**

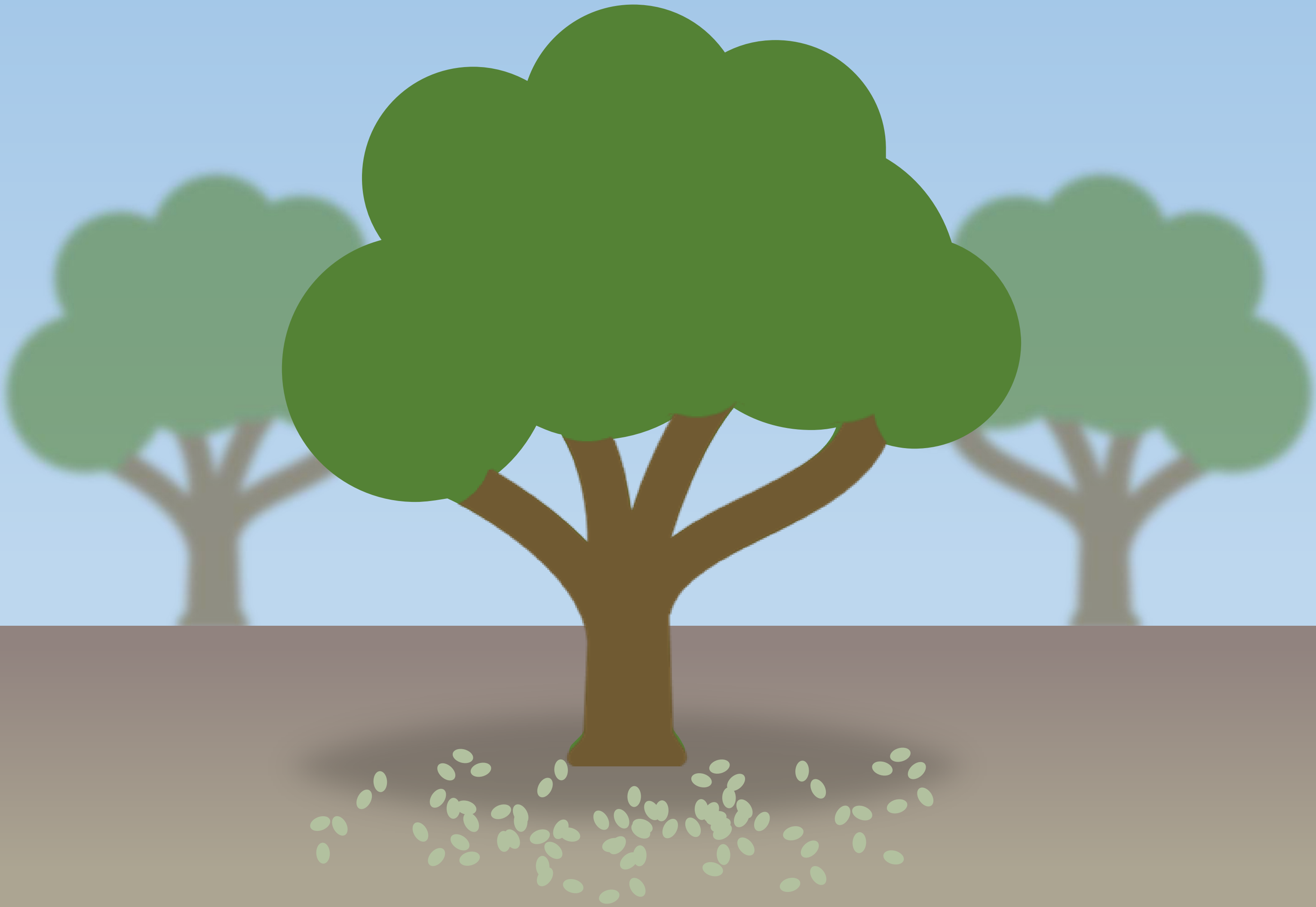


Conventional harvesting



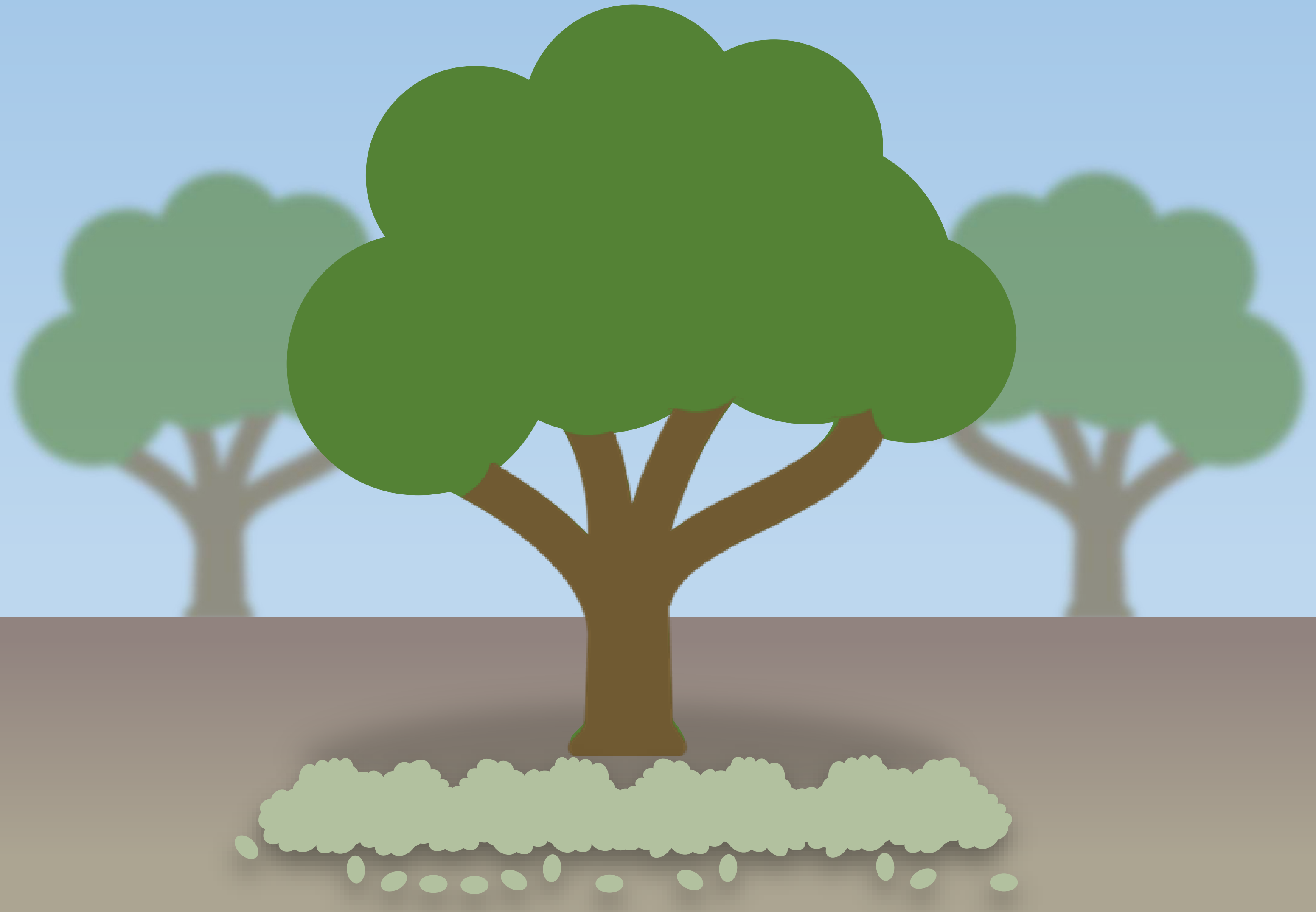
Conventional harvesting

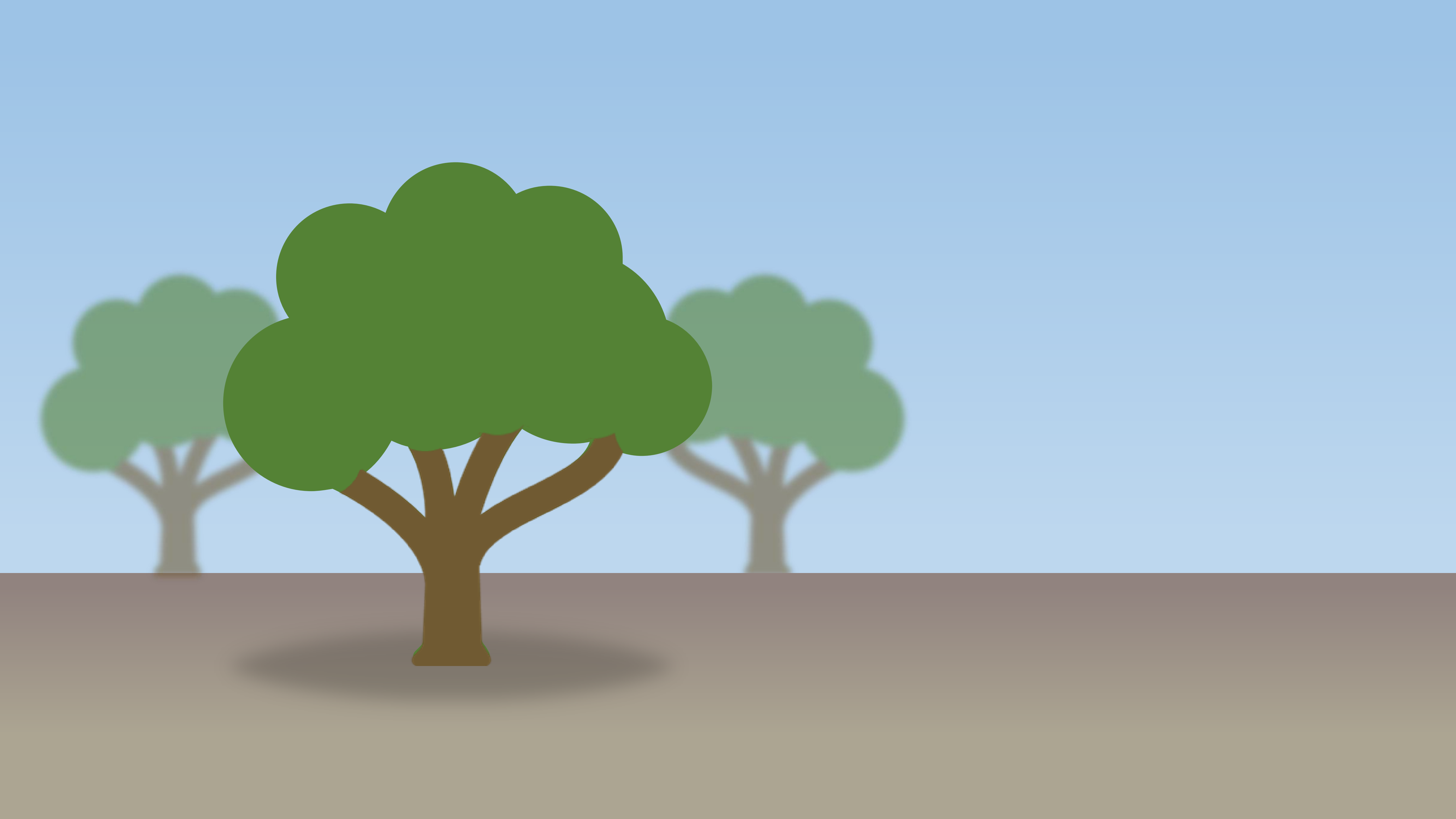
Conventional harvesting



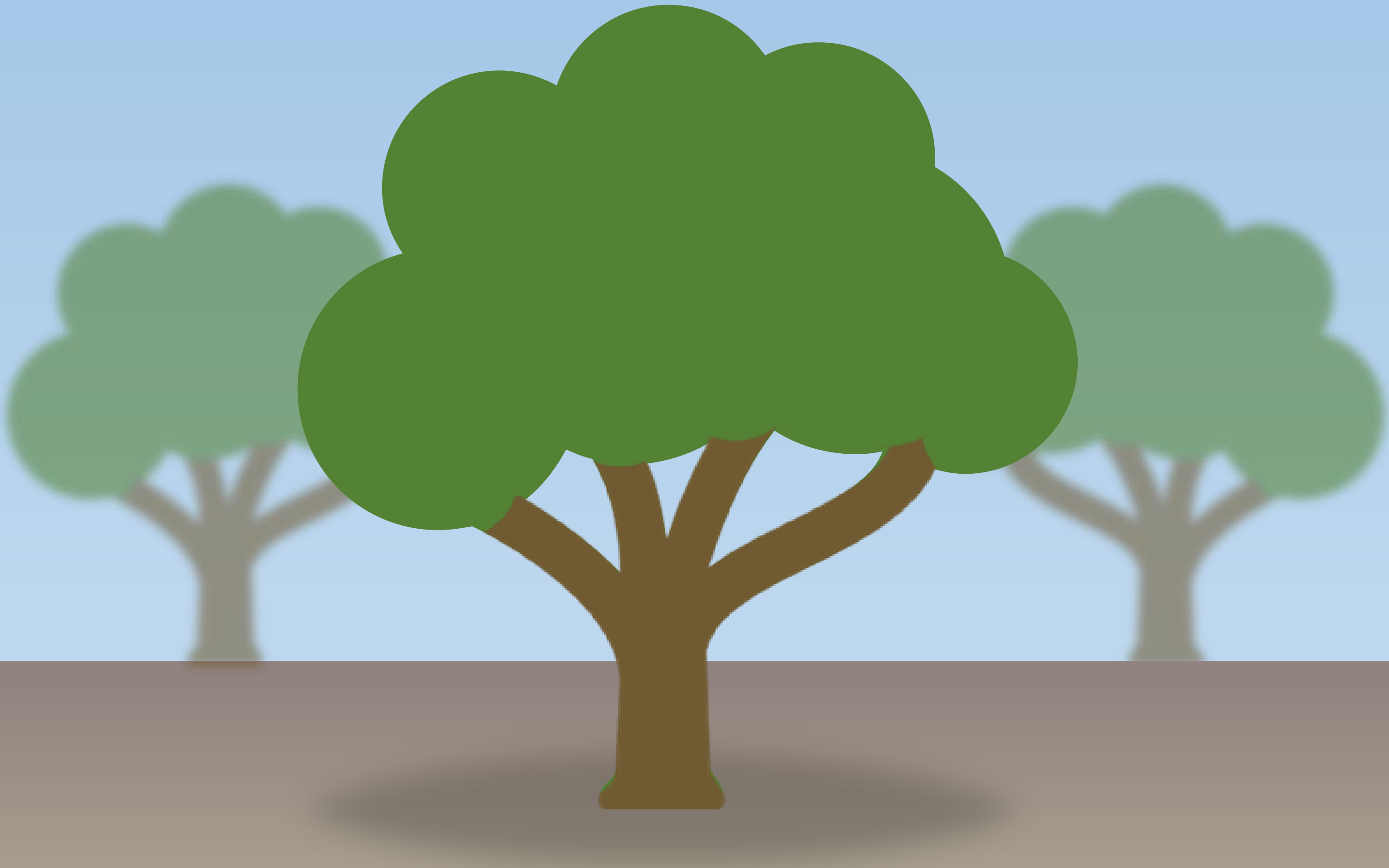
Conventional harvesting

Conventional harvesting





Off-ground harvesting

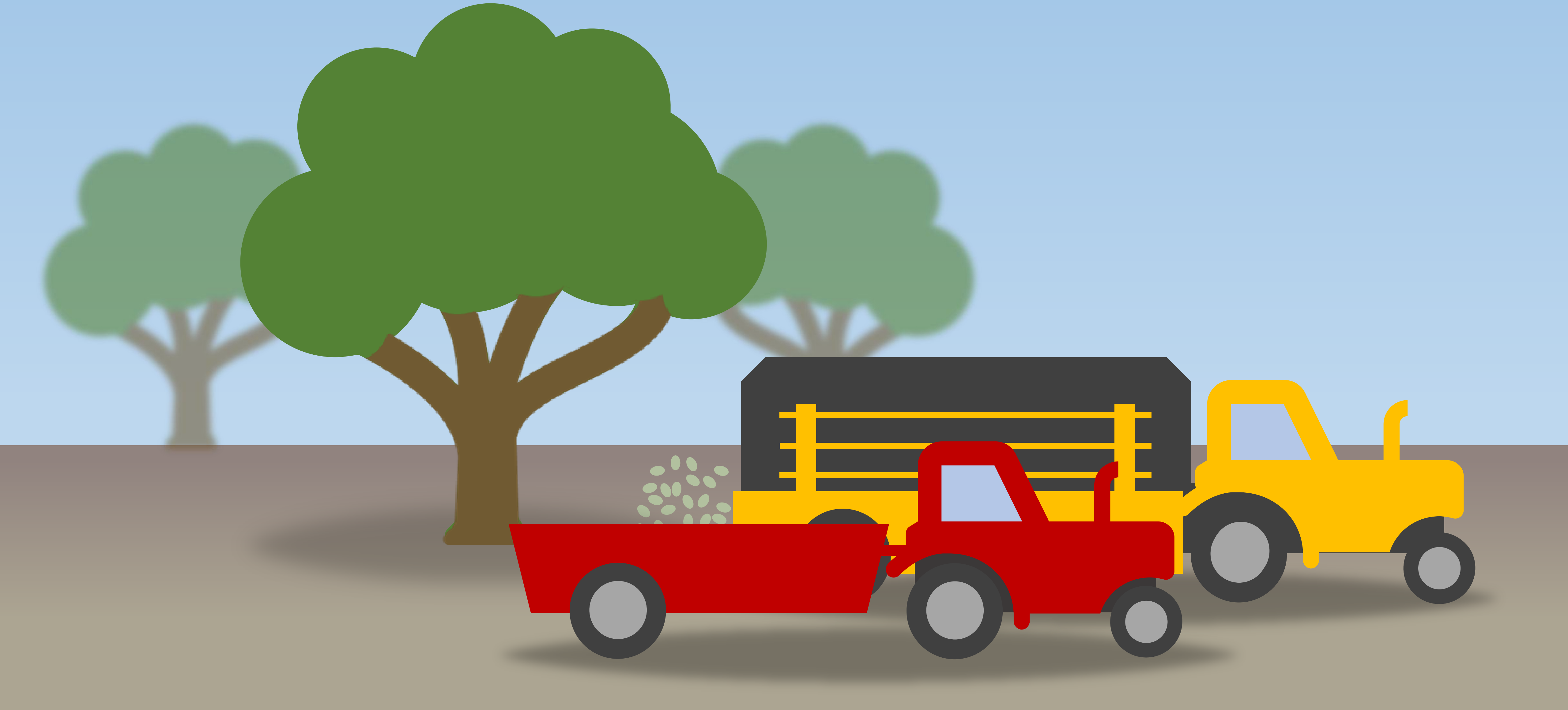


Off-ground harvesting

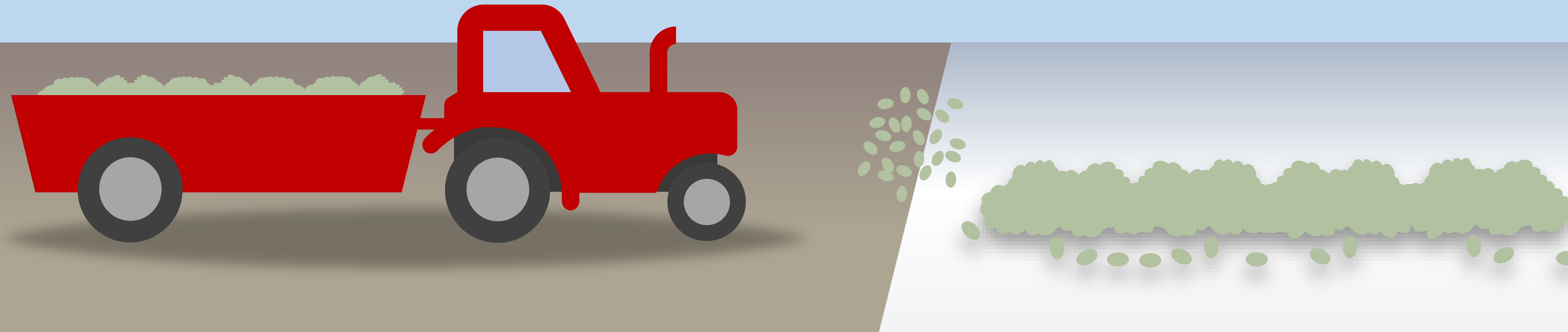
Drying scenario 1

Drying scenario 2

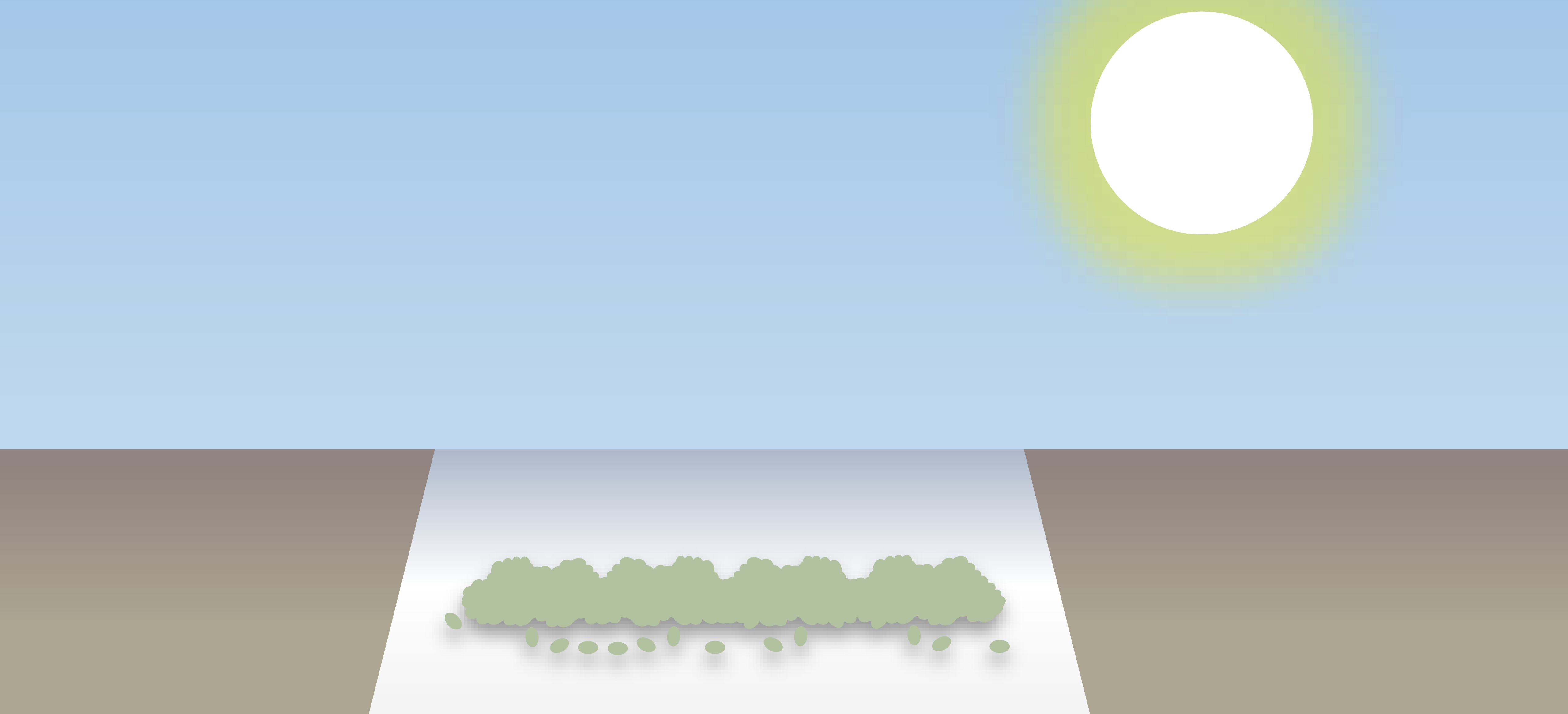
Drying scenario 2



Drying scenario 2



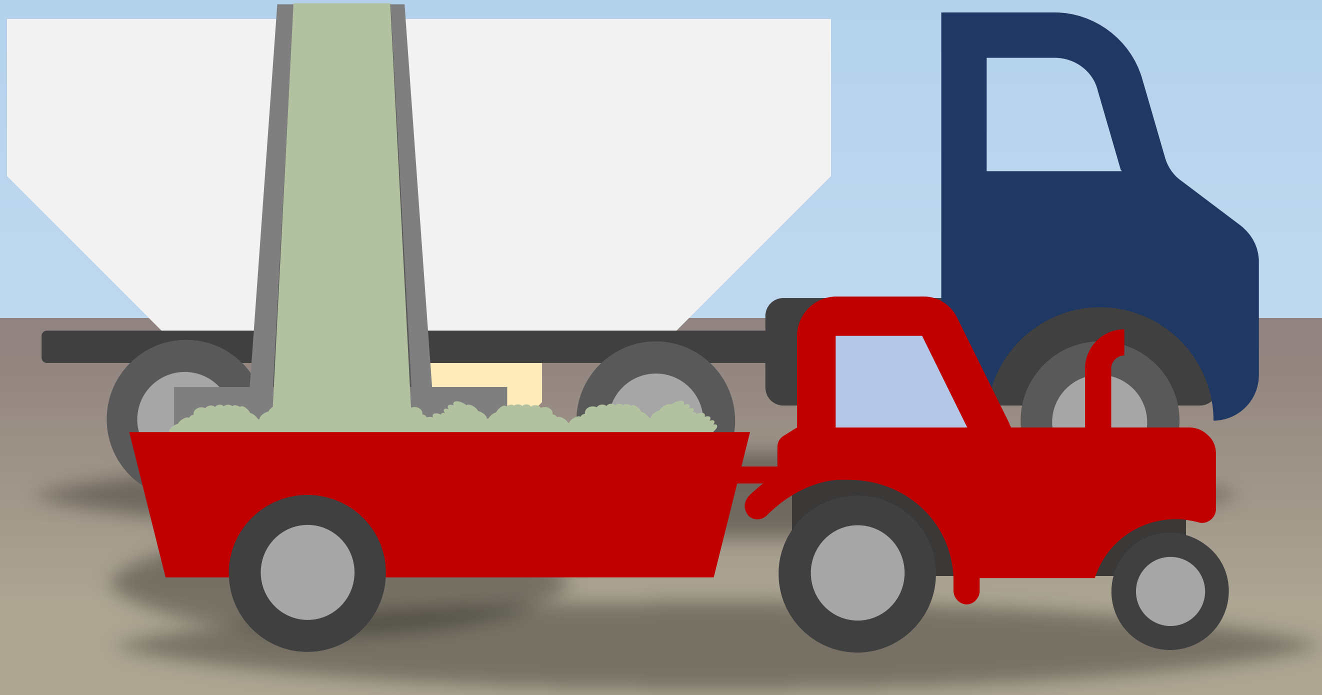
Drying scenario 2



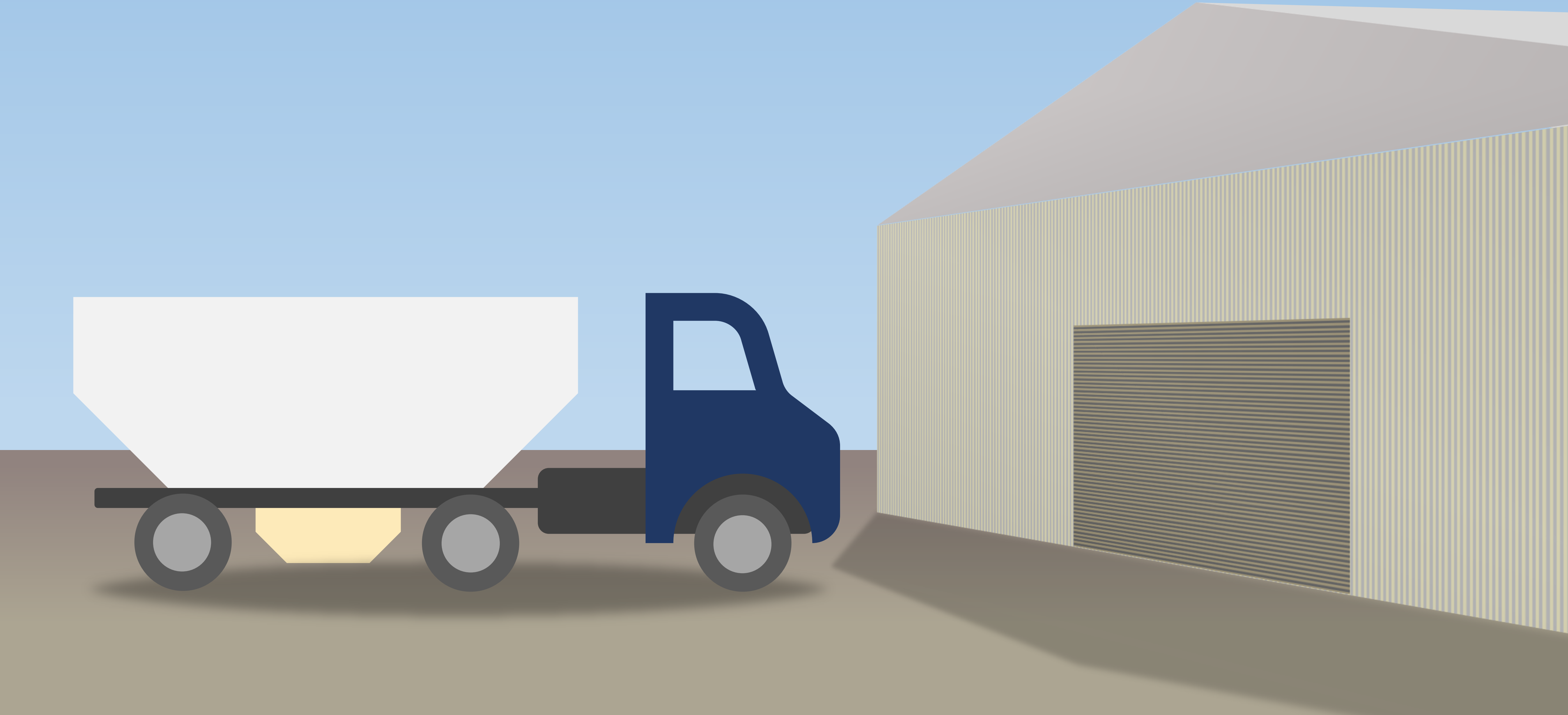
Drying scenario 3

Drying scenario 3

Drying scenario 3



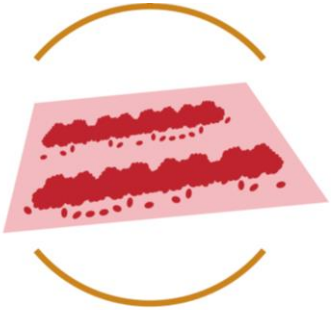
Drying scenario 3



Scenarios

Off-ground harvesting

In-orchard windrow drying



Lot drying

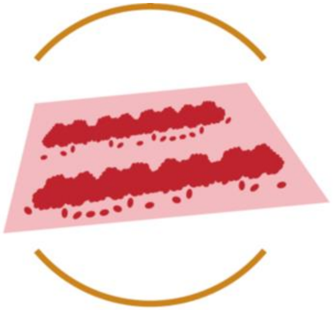
Mechanical drying

Scenarios

Off-ground harvesting

In-orchard windrow drying

- Conventional vs low-dust pickup
- Soil stabilization vs bare soil

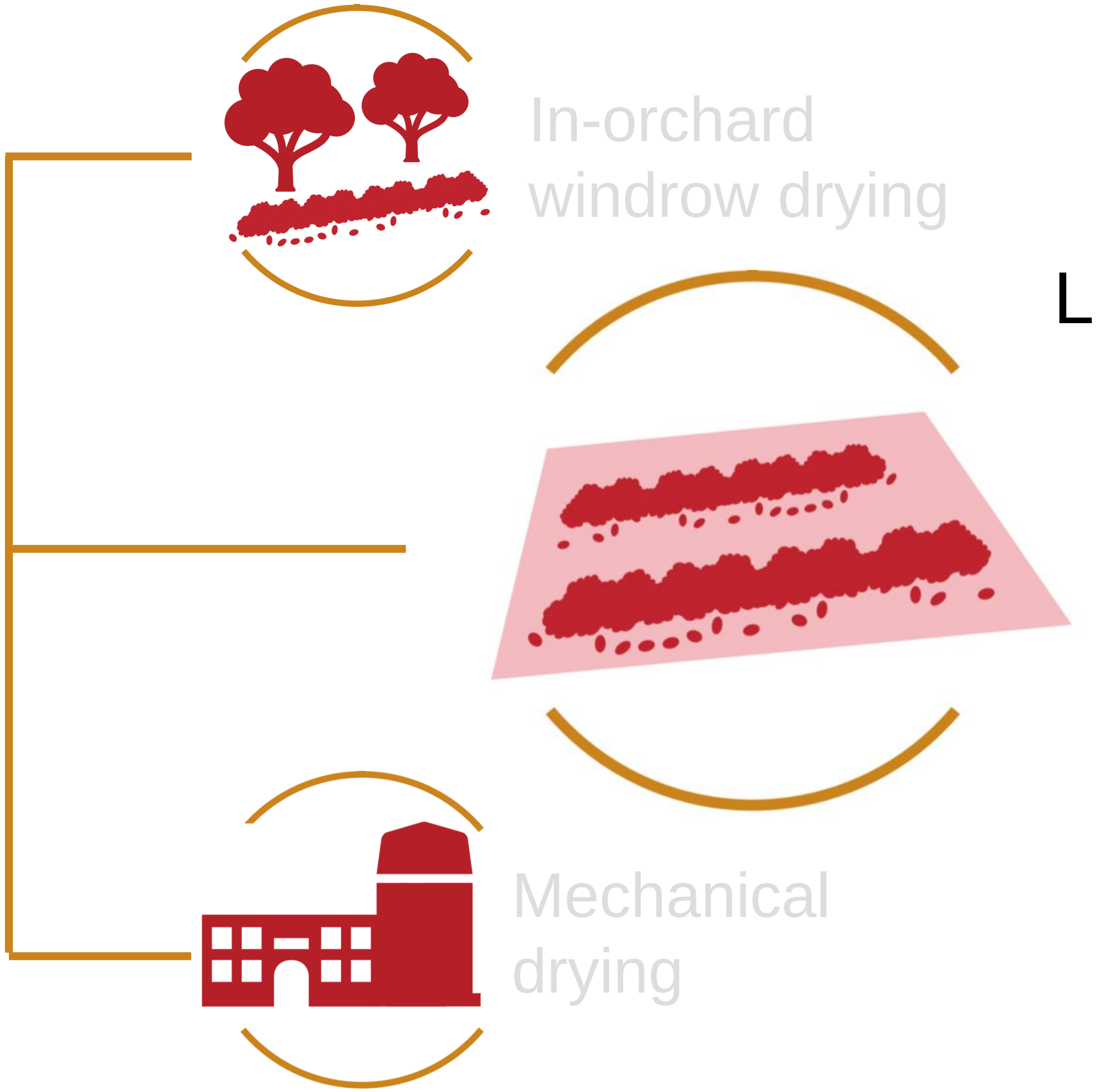


Lot drying

Mechanical drying

Scenarios

Off-ground harvesting



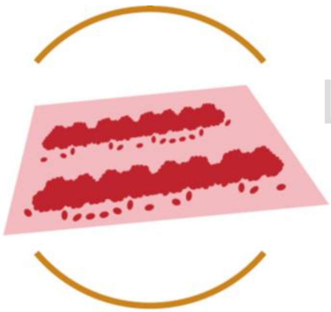
Lot drying

- Land availability and cost
- Lot size
- Soil stabilization vs bare soil
- Possibility of turning almonds

Scenarios

Off-ground harvesting

In-orchard windrow drying

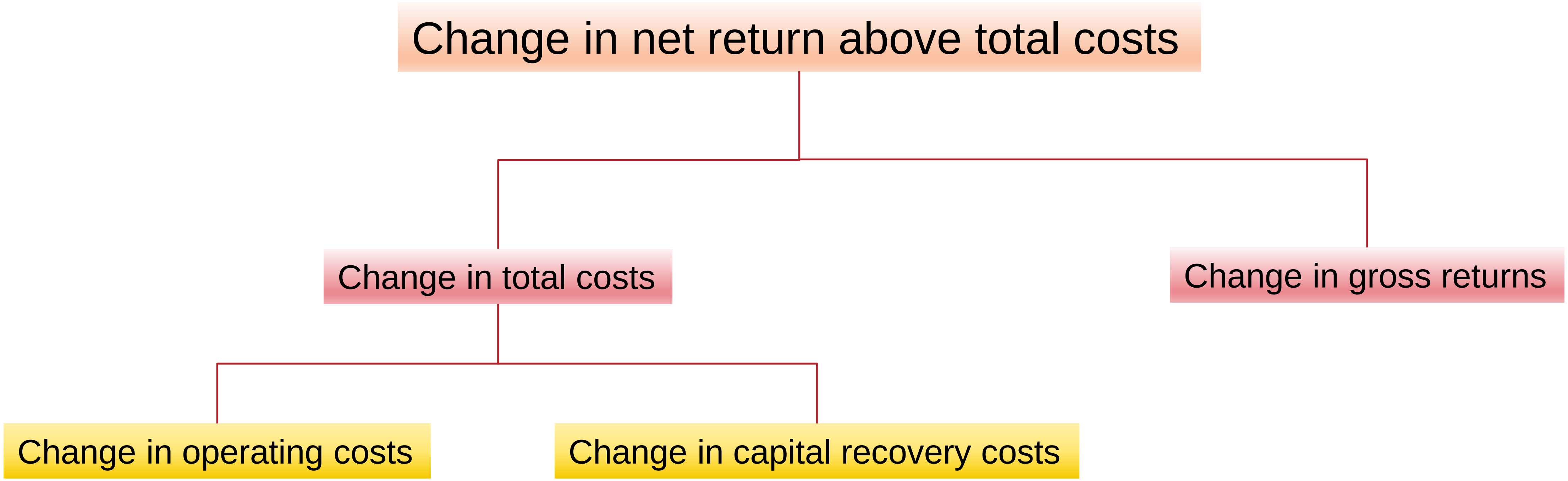


Lot drying

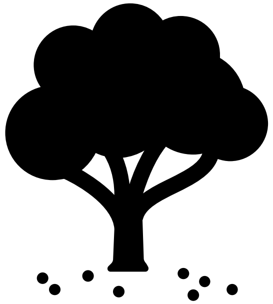
Mechanical drying

- Dryer format and cost
- Increased hauling cost

Economic metrics

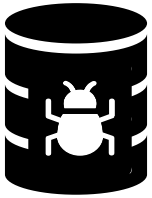


Expected effects

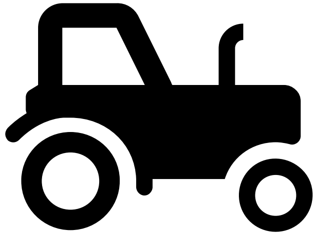


Losses due to windfall; may be affected by
- Region
- Variety
- Harvest schedule

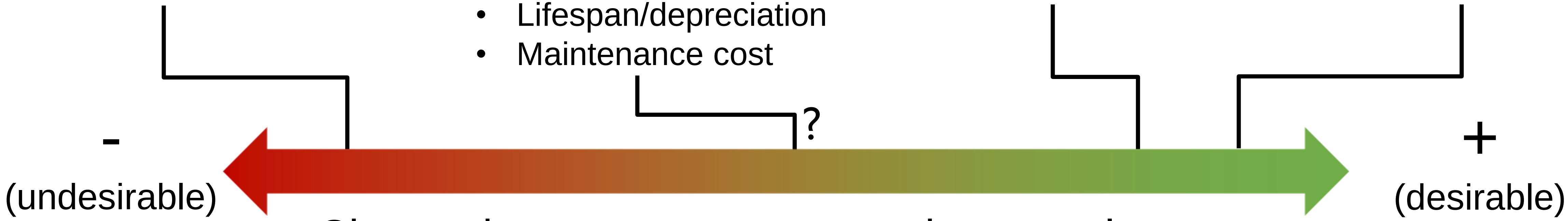
Harvesters; effect currently unknown; rental cost will be affected by
- Capital cost
- Fuel/labor demand/cost
- Lifespan/depreciation
- Maintenance cost



Cultural practices
- Fewer pest control measures needed
- Less stringent leveling needed

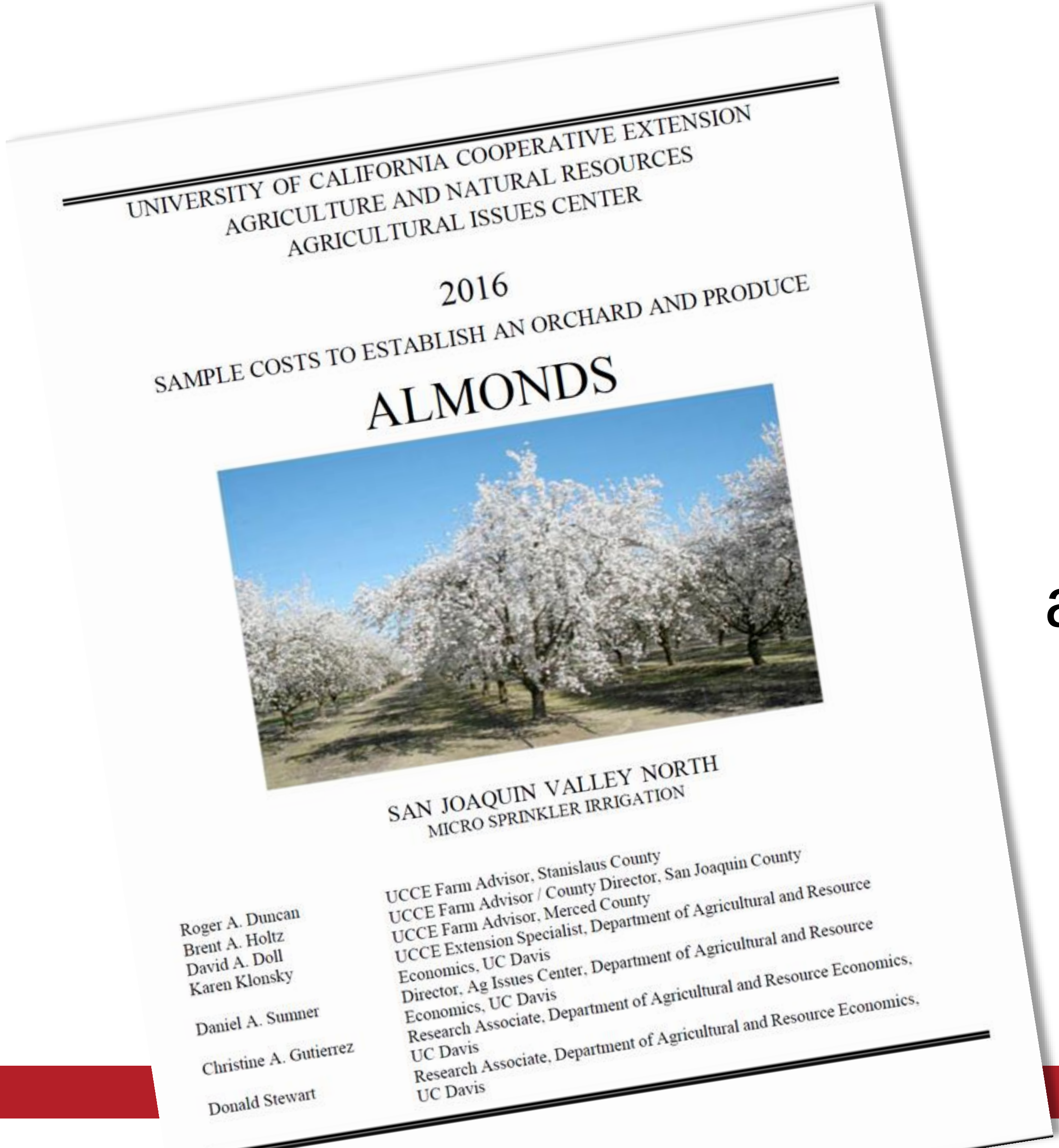


Harvest operations
- Blowing/sweeping are avoided
- Pickup may be avoided



Change in net return per acre above total costs relative to conventional practices ($/acre)

Sources



UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
AGRICULTURE AND NATURAL RESOURCES
AGRICULTURAL ISSUES CENTER

2016

SAMPLE COSTS TO ESTABLISH AN ORCHARD AND PRODUCE

ALMONDS

SAN JOAQUIN VALLEY NORTH
MICRO SPRINKLER IRRIGATION

Roger A. Duncan	UCCE Farm Advisor, Stanislaus County
Brent A. Holtz	UCCE Farm Advisor / County Director, San Joaquin County
David A. Doll	UCCE Farm Advisor, Merced County
Karen Klonsky	UCCE Extension Specialist, Department of Agricultural and Resource Economics, UC Davis
Daniel A. Sumner	Director, Ag Issues Center, Department of Agricultural and Resource Economics, UC Davis
Christine A. Gutierrez	Research Associate, Department of Agricultural and Resource Economics, UC Davis
Donald Stewart	Research Associate, Department of Agricultural and Resource Economics, UC Davis

Prior cost study by UC Davis and UC Cooperative Extension

california almonds
Almond Board of California

Sources

Experts from

california almonds® Almond Board of California

UC DAVIS

UCCE University of California Cooperative Extension

Nicolaus Nut Co.

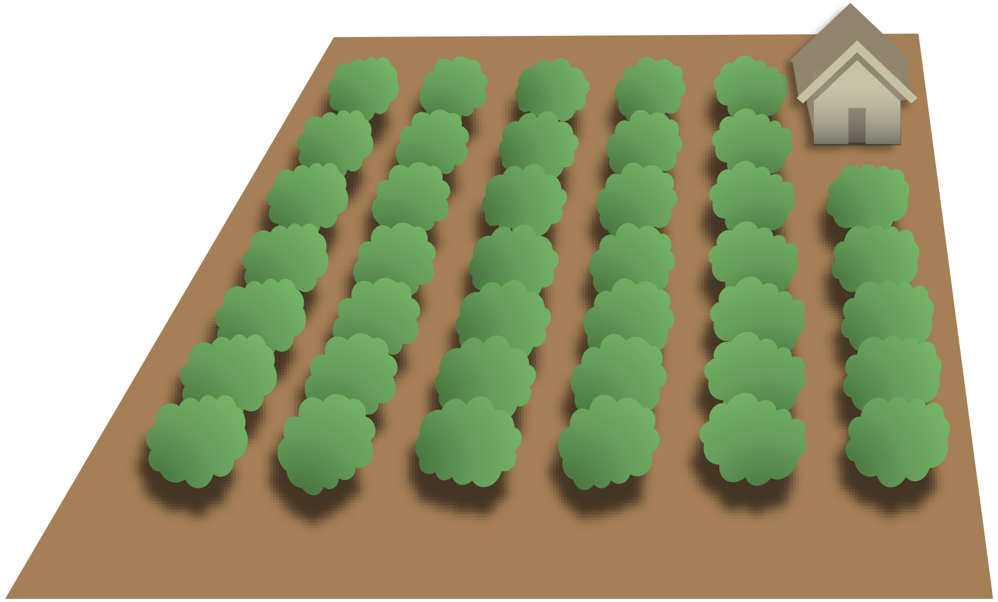
AFRON

North State Hulling Cooperative, Inc.

...along with cost data from additional vendors and service providers

Assumptions

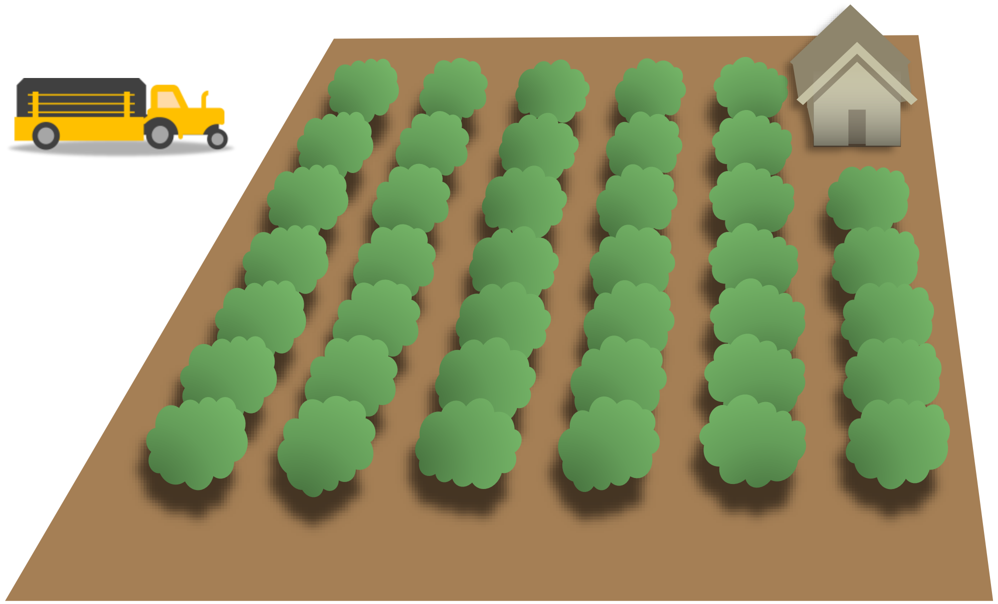
Model developed for a hypothetical orchard



- 100 acre orchard
- >4 years old
- 2200 lb/acre yield
- $2.50/lb selling price
- 1% windfall
- Conventional sanitation, fertilization, irrigation, pest management, pruning, pollination etc. agree with existing cost study

Assumptions

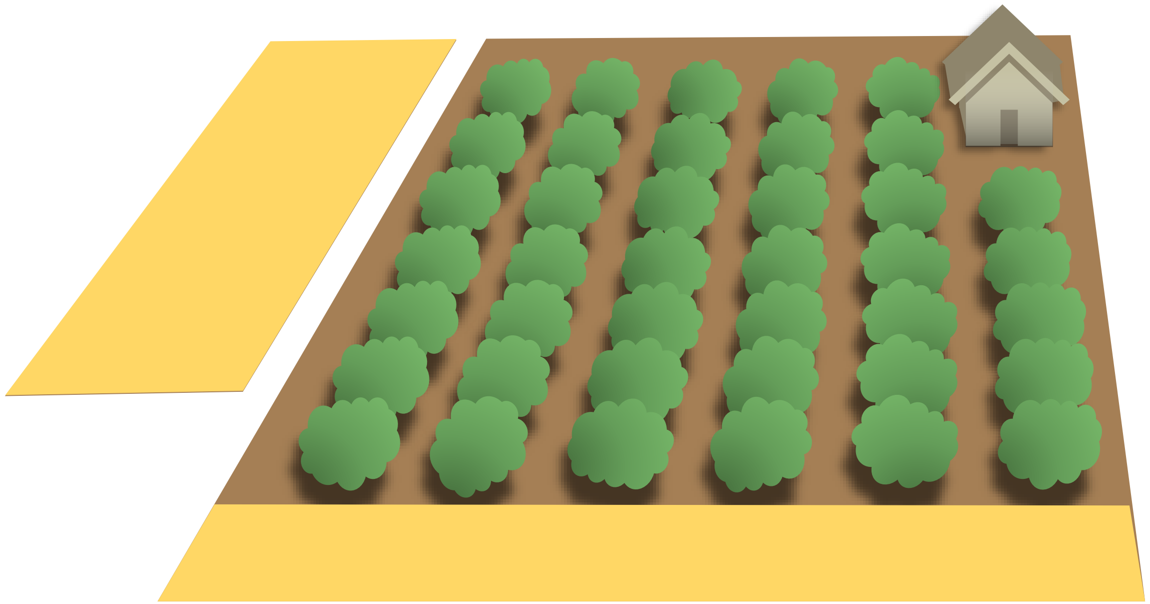
Off-ground harvesters



- Off-ground harvesters can be utilized at a cost similar to conventional harvesters
- Off-ground harvesters have no loss

Assumptions

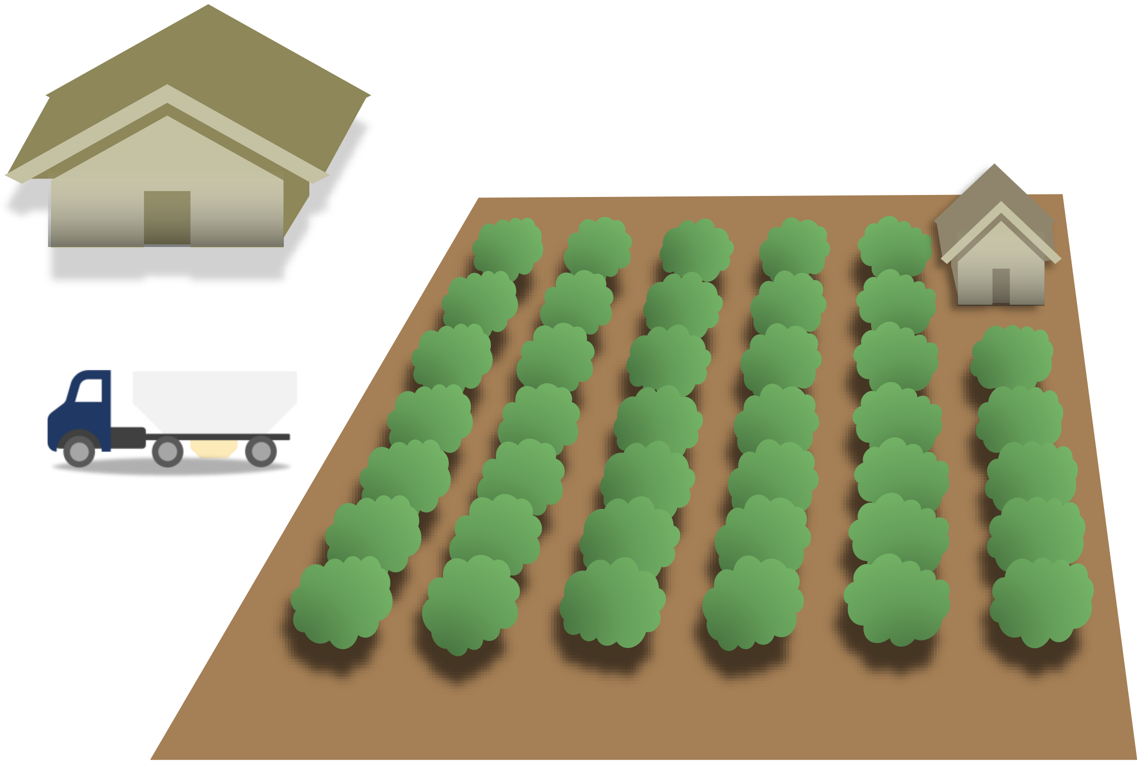
Drying lot scenario



- Drying lot sized 5-7 acres
- Land not currently used for production
- Land either owned by grower or leased near orchard
- Hand raking is required

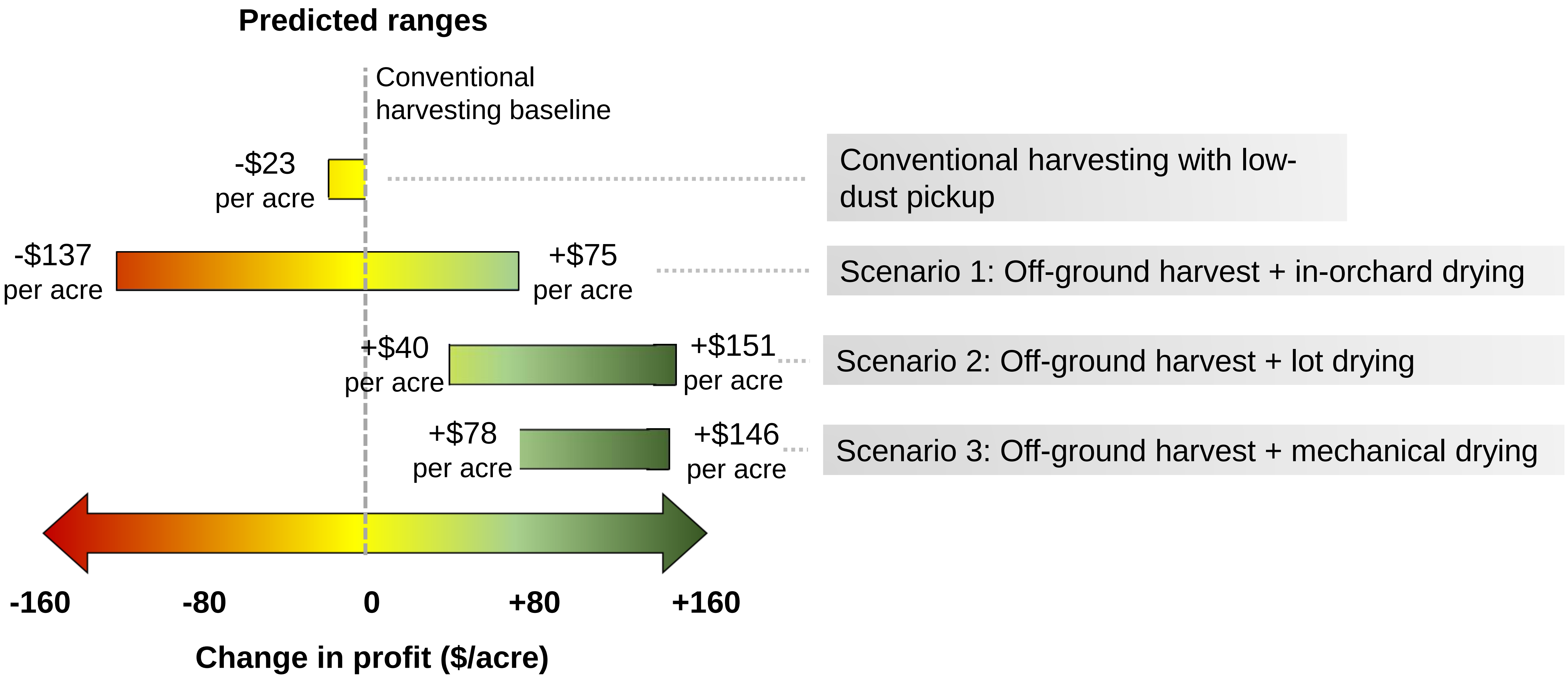
Assumptions

Mechanical drying scenario



- Mechanical drying of almonds can scale to accommodate all off-ground harvesting

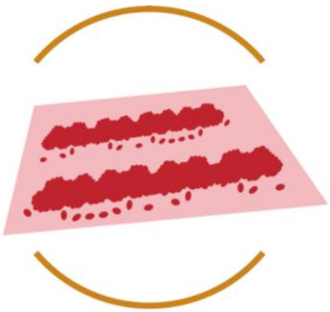
Results - Overview



Results - Detailed

OFF-GROUND HARVESTING

In-orchard windrow drying



Lot drying

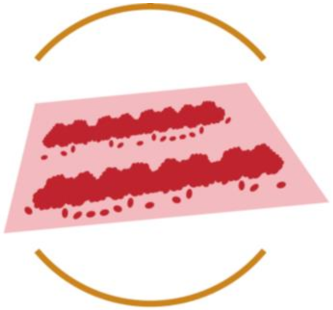
Mechanical drying

Results

OFF-GROUND HARVESTING

In-orchard windrow drying

		Change in profit
No soil stabilization	Conventional pick-up	+$75 per acre
	Low-dust pick-up	+$53 per acre
Soil stabilization	Conventional pick-up	-$115 per acre
	Low-dust pick-up	-$137 per acre



Lot drying

Mechanical drying

Results

OFF-GROUND HARVESTING

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Lot drying

		Change in profit
5-acre lot	No stabilization	+$151 per acre
	Soil stabilization	(+$86 to +$92)/acre
6-acre lot	No stabilization	+$141 per acre
	Soil stabilization	(+$63 to +$70)/acre
7-acre lot	No stabilization	+$131 per acre
	Soil stabilization	(+$40 to +$48)/acre

Mechanical drying

Results

OFF-GROUND HARVESTING

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Mechanical drying

	Change in profit
Drying: $0.02/lb meat	+$146 per acre
Drying: $0.03/lb meat	+$120 per acre
Drying: $0.048/lb meat	+$78 per acre

Results

OFF-GROUND HARVESTING

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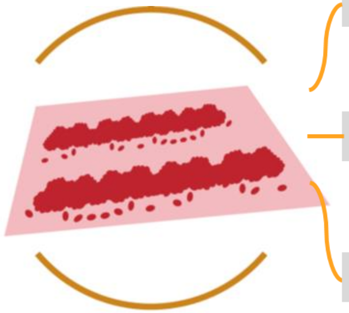
Lot drying



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Drying: $0.03/lb meat	+$120 per acre
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Results

MORE DUST CONTROL

EXPECTED DUST MITIGATION

	Predicted change in profit ($/acre)
Off-ground harvest + mechanical drying	+$120
Off-ground harvest + lot drying with tarping	+$86
Off-ground harvest + lot drying with soil amendment stabilization	+$92
Off-ground harvest + lot drying	+$151
Off-ground harvest + soil stabilization + in-orchard windrow drying + low dust pickup	-$137
Off-ground harvest + in-orchard windrow drying + low dust pickup	+$53
Off-ground harvest + soil stabilization + in-orchard windrow drying	-$115
Off-ground harvest + in-orchard windrow drying	+$75
Conventional harvest + soil stabilization	-$190
Conventional harvest + low-dust pickup	-$23
Conventional harvest	-$0

LESS DUST CONTROL

Research targets

- How much windfall occurs? What is the quality of windfall almonds?
- Can drying on tarped soil reduce dust during pickup? Can tarps withstand pickup machines?
- Can soil stabilizers reduce dust during almond pickup? Do such stabilizers affect almond quality?
- What are the optimal drying conditions for almonds in various mechanical dryer and static pile formats?
- What are appropriate drying lot conditions (layer thickness, turning, duration)?

Acknowledgements

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- Gabriele Ludwig
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