San Joaquin Valley Air Pollution Control District
AB 617 Community Emission Reduction Program

Low Dust Nut Harvester Emission Reduction Program Plan

Shafter Community

1. Project Identification

Project Identification: *A.2: Provide enhanced incentives to replace conventional nut harvesting equipment with new, low dust nut harvesting equipment.*

This is a Community Identified Project included and prioritized in the California Air Resources Board (CARB) and District adopted Shafter Community Emission Reduction Program (CERP).

This measure will reduce fine Particulate Matter ($PM_{2.5}$) emissions from nut harvesting operations by providing incentives for Shafter Community residents to replace their conventional nut harvesting equipment with new, low dust nut harvesting equipment.

Community Support

This measure received support from the Shafter Community Steering Committee and was included in the adopted Community Emission Reduction Program. Information about the Steering Committee is included below:

(1) Name of the community group
   a. Shafter Steering Committee Map
(2) Purpose of community group
   a. AB617 Community Engagement and Public Input
(3) Total number of members in the community group
   a. Shafter – 27 members
(4) Date of formation/establishment
   a. Shafter – December 2018
(5) A description of the decision-making process must be included.
   a. Shafter Steering Committee Charter
(6) Community Support Demonstration
   a. Shafter CERP

Mechanism for Informing Community

This measure has been discussed at Community Steering Committee meetings in addition to the outreach activities conducted to inform residents of the program and requirements for participation. The outreach conducted has and will continue to be the following:

- Social media
- Mailers
- Print ads
- Press releases and press events
- Bus ads
- Events, town halls, webinars, etc.
- Other ideas as brought up by committee

Background

The process of tree nut harvesting is a multi-step operation, which requires various specialty equipment. Due to the nature of on-ground harvest, it is a significant dust-producing operation. The process begins with the use of tree shaking equipment in order to knock the nuts from the tree to the ground. Once the nuts have been shaken off the tree, nut sweeping equipment goes through each row of the orchard to sweep the nuts into a windrow to be dried. After the nuts have been thoroughly dried, nut harvesters then go down each windrow and pick up all of the nuts off the ground. According to *CARB's 2012 Adoption of a Revised Harvesting Emission Factor for Almonds*, the shaking, sweeping and pick up operations during nut harvest produces approximately 3.47, 4.15, and 23.60 pounds of PM10 per acre harvested, respectively.

As detailed above, the pickup operations during the nut harvesting process are responsible for approximately 75% of the $PM_{2.5}$ emissions. In order to address the high level of $PM_{2.5}$ emissions produced during pickup operations, most of the major harvester manufacturers are producing models that significantly reduce $PM_{2.5}$ emissions.

To test these claims of new, low dust certified harvester models, a study conducted by Texas A&M University (*Establishment of Newer* $PM_{2.5}$ *Emission Factors with Various Almond Harvesting Machinery*) compared the PM emissions produced by a conventional harvester, versus the emissions produced by several different new harvester models. To determine the emissions, the study required each harvester model to run normal pickup operations in the same field. Samplers were located on both the downwind and upwind sides of the orchard to measure the PM concentrations based on the current wind patterns. To ensure accurate results, the study was conducted at two different locations, and each harvester model was required to run through the same amount of orchard rows at the same speeds. According to the results, the new, low dust harvesters reduced $PM_{2.5}$ emissions by a minimum of 40%, and a total average of approximately 53%.

In addition to the aforementioned harvester models, there is also a dust-free nut shaker/sweeper built by the Tenias Harvester Corporation. This harvester combines the shaking and sweeping, of nut harvesting operations into one machine, eliminating the emissions from the sweeping operation. This equipment works in limited orchard applications.

Participant Requirements

(A) Low Dust Nut Harvester Program Eligibility

The Low Dust Nut Harvester program guidelines are attached to this program plan as Exhibit A. In implementing this CERP measure, the District will follow existing program guidelines and eligibility criteria. Existing conventional nut harvesters must be located and operated within the Shafter Community. Participants must submit an application and obtain an executed contract from the District prior to purchasing their new piece of equipment. The new equipment must be the same type as the old equipment (i.e., PTO-driven harvester for PTO-driven harvester, etc.), with the exception of applicants being allowed to turn in both an old Ag tractor and PTO-driven harvester for a new self-propelled harvester.

To be eligible for replacement, existing conventional shakers, sweepers and harvesters must be:

1) A pull behind or a self-propelled off-road agricultural nut harvester that is not a low dust verified model. If the old nut harvester is self-propelled it must have a compression-ignition (CI) engine greater than or equal to 25 horsepower.
2) The self-propelled nut harvester and or Ag tractor must have an uncontrolled (Tier 0), Tier 1, or Tier 2 engine. This must be documented in the application and will be verified through an inspection process conducted by SJVAPCD staff.
3) Owned and operated in California for the previous two (2) years. If selected for funding, the participant must submit supporting documentation.
4) In operational condition at the time of application submission and SJVAPCD inspections. If selected for funding, the participant must submit documentation demonstrating that the old equipment has been in operational condition for the previous year.
5) Must be destroyed or rendered permanently in-operable after the new equipment is placed into operation. Destruction of the old equipment must be performed by a participating dismantler contracted with the SJVAPCD. Participant is required to refer to “Payment Procedures” document for full destruction requirements.

(B) Participant Requirements

The Low Dust Nut Harvester program application is attached to this program plan as Exhibit B. A certification section is included in the application and

details participant requirements. Participation in the program occurs in several phases:

1) Participants will be required to submit a complete project application, which includes a quote for the new harvester and a W-9 tax form.

2) Applications selected for funding will be processed by District staff, which includes, but is not limited to, data entry into the database, pre-inspection of the harvesters, and information verification. The participant will also be required at this time to submit ownership and usage documentation for the old harvester.

3) Once the application is deemed complete and eligible, a five year contract will be offered to the participant. Once both parties have agreed to sign the contract, the participant will be notified of the contract execution, at which point they may then purchase the new harvester.

4) Once a Participant has purchased and received their new harvester, they may submit a claim packet for reimbursement. A complete claim packet is required as part of the reimbursement process and must include the invoice from the purchase of the new harvester, proof of payment from the purchase, insurance documentation for the new harvester, as well as a few included forms filled out and signed by the participant. During this time, District inspectors will inspect and take photos of both the new and dismantled old harvesters. District staff will review submitted claim packets and reimburse for eligible costs, up to the approved contract amount.

Funding Amounts

The approved CERP includes $2,500,000 for the Shafter Community for the implementation of this measure. The proposed funding would cover 75% of the cost of each replacement unit.

Table 1 summarizes the eligible new, low dust harvester models available to Shafter community residents through the Low Dust Nut Harvester Program. If the purchase price of the new harvester is less than what was originally quoted, the final incentive amount reimbursed to the participant will be proportionally reduced. Additionally, participants must pay for any costs that exceed the incentive amount.

Table 1. Eligible Low Dust Harvester Models

Manufacturer	Model	Drive	Technology Notes
Harvesters (Pick-Up Equipment)			
Exact Corporation	E-3800	Pull-behind PTO	Features a water misting and brush system at the separation fan
	E-4000	Pull-behind PTO	
	E-7000 SP	Self-Propelled	
Flory Industries	Model 860 XL	Pull-behind PTO	Reduced fan speed, longer cleaning chain length, and changes to location of dust discharge.
	Model 8600 XL	Self-Propelled	
	Model 8770 XL	Self-Propelled	
Jackrabbit	Harvester	Pull-behind PTO	Disk-based cleaning section, with twin-rod outload chain. Adjustable fan speed and damper.
Weiss-McNair	9800 California Special	Pull-behind PTO	Reduced fan speed, fan location, enlarged vacuum and separation chambers, and cleaning chain design.
	Magnum X	Self-Propelled	
Shaker/Sweeper Combination Unit			
Tenias	Almond Harvester	Self-Propelled	Shaker drops nuts onto a plate and funnels them into windrows; eliminates need for sweeping process (sweeper/shaker in one combined unit)

Project Selection and Reporting

Projects will be approved on a first come, first served basis determined by the submittal of a complete program application.

The District will report program information in accordance with Community Air Protection program guidelines found at: https://ww3.arb.ca.gov/msprog/cap/docs/cap_incentives_2019_guidelines.pdf.

Emission Reduction Calculations

To estimate the emission reductions, District staff will perform an emission reduction calculation using the reduction percentage for the respective new equipment model (see Table 2 below).

Reductions Per Model Type	
Equipment Name	Percent $PM_{2.5}$ Reduction (%)
Exact	41
Flory	51
Jack Rabbit	62
Weiss McNair	57

According to *ARB's 2012 Adoption of a Revised Harvesting Emission Factor for Almonds*, pickup operations during almond harvest produce approximately 23.6 lbs. of PM10 per acre. Results from the study conducted by Texas A&M University (*Establishment of Newer* $PM_{2.5}$ *Emission Factors with Various Almond Harvesting Machinery*) show that the average ratio of $PM_{2.5}$ to PM10 concentration is approximately 12.5%. Therefore, it can be estimated that pickup operations during almond harvest produce approximately 2.95 lbs of $PM_{2.5}$ per acre. District staff will then convert that amount to tons of $PM_{2.5}$ per acre, and then further extrapolate to determine the tons of $PM_{2.5}$ per acre produced over the course of 5 years. By multiplying the calculated amount of tons by a specified amount of acres, the total amount of $PM_{2.5}$ for a given harvest area can be determined.

Once the 5-year $PM_{2.5}$ emissions are calculated, District staff will once again utilize the results from the study conducted by the University of Texas A&M, which showed that new, low dust harvesters reduce $PM_{2.5}$ emissions anywhere from 41% to 62%, depending on the manufacturer. Using these values, District staff will then multiply the 5-year $PM_{2.5}$ emission baseline by the respective reduction percentage to calculate the annual and lifetime $PM_{2.5}$ reductions for the unit. By dividing the lifetime reductions for the unit by the incentive amount, the cost-effectiveness will be determined for the project.