Options to Mitigate Acute Exposures to 1,3-Dichloropropene

Public Workshop

October 17, 2019

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Workshop Goal

Explore additional measures to protect bystanders and residents from short-term inhalation exposure to 1,3-dichloropropene (1,3-D).

These measures include buffer zone requirements, application rate limits, and tarping.

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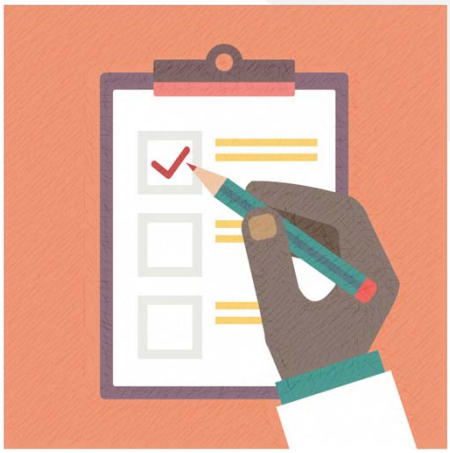
Presentation Outline

- Background
- Risk Characterization Document and Reference Concentration
- Mitigation Approach
- Mitigation Options
- Implementation Timelines
- Public Comment



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Background: 1,3-Dichloropropene

- Pre-plant fumigant used to control nematodes, insects, and disease organisms in the soil.
- Major uses in California in fruit and nut trees, strawberries, grapes, carrots, and several other food and non-food crops.
- Listed as a restricted material (i.e., a higher risk pesticide) and requires a restricted materials permit from the local county agricultural commissioner to apply.
- Various mitigation measures to control exposure to 1,3-D have been in place in California since 1995.

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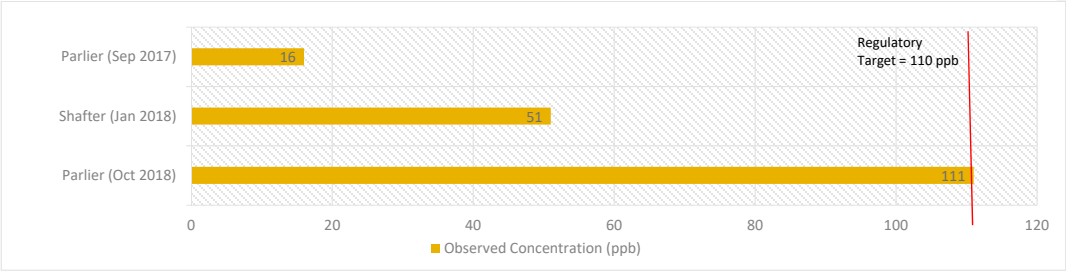
Background: Need for Mitigation

- DPR is proposing to mitigate acute exposures of 1,3-D, which has been prompted by high concentrations at DPR's Shafter and Parlier air monitoring stations.



- DPR is exploring additional control measures necessary to mitigate 1,3-D acute health effects to bystanders as identified in DPR's Risk Characterization Document (RCD).
- DPR will be proposing to address acute and cancer exposures in a single rulemaking.

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2015 Risk Characterization Document

- In 2015, DPR issued a comprehensive Risk Characterization Document (RCD) for 1,3-D. This document identifies potential risks to human health associated with the allowed use of 1,3-D.
- Analysis in the RCD is used to set the regulatory target concentration necessary to initiate and guide the development and adoption of mitigation measures to address acute exposures to residential and occupational bystanders from 1,3-D.
- 2015 RCD endpoint: weight gain decrement in laboratory rats after 3 days of inhalation exposure. This is an indication of systemic toxicity.

Acute Reference Concentration

- Reference concentration is derived by translating the animal data into a human equivalent concentration.
- Value depends on the uncertainty factor used to account for differences.
- DPR derived a reference concentration of 110 ppb in its 2015 risk characterization document.
- In its peer review of DPR's RCD, and in order to account for uncertainties in the intraspecies pharmacokinetic data, OEHHA recommended an additional 2x uncertainty factor, leading to a derived reference concentration of 55 ppb.
- Mitigation scenarios for both concentrations are proposed in subsequent slides.

Mitigation Approach

- Historically, DPR has based its fumigation mitigation on select field studies submitted by registrants.
- DPR will use computer simulations (HYDRUS and AERFUM) to determine mitigation measures for 1,3-D.
- This allows DPR to fill in the gaps between submitted field studies and all allowed application methods.
- DPR has completed an external peer review coordinated by the University of California on the use of HYDRUS and AERFUM to model emissions from 1,3-D applications.

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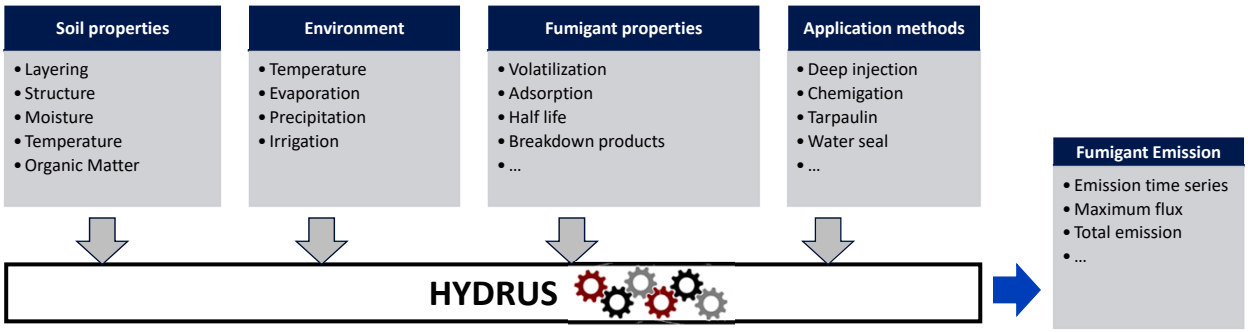
Assessing the fate of fumigants in soil using HYDRUS

- State-of-the-art model for water, dissolved material, heat, and gas movement in the soil
  - Validated by multiple field studies and for different application methods of 1,3-D
  - Applicable for all fumigants and application methods
  - Has been used by DPR and other scientists around the globe for more than 20 years



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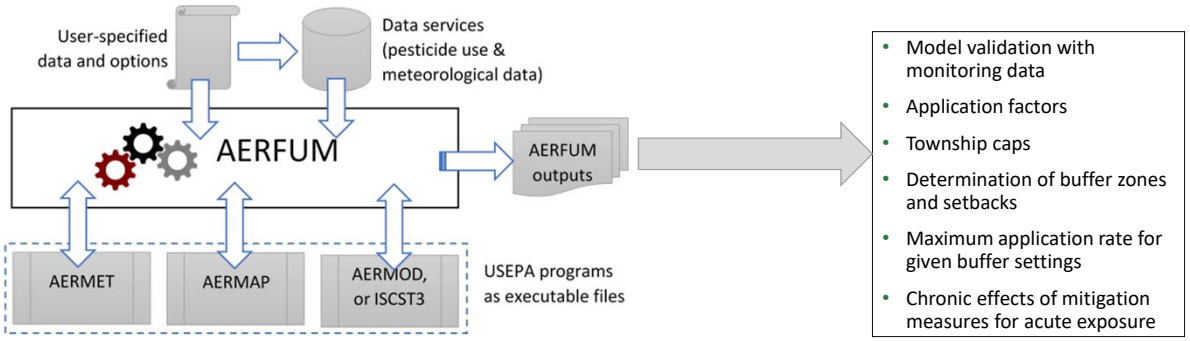
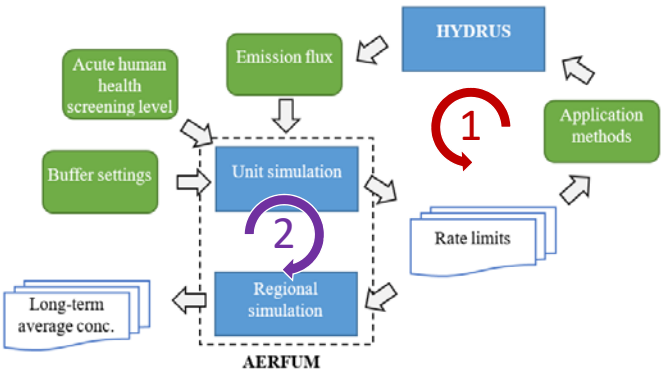
AERFUM: Air Exposure and Risk model for FUMigants

- Developed by DPR as an air dispersion modeling system
  - Based on USEPA's AERMOD as the simulation engine
  - Incorporates DPR's methodology for mitigating exposures from soil fumigants
  - Has been used for acute and chronic exposure assessments of 1,3-D



HYDRUS-AERFUM Coupling

Model	Sub-model	Purpose
HYDRUS • Used to predict 1,3-D emission rates from soils		Application methods
AERFUM • Used to predict air concentrations of 1,3-D	AERFUM unit simulation	Application rates, buffer zone
	AERFUM regional simulation	Regional, long-term concentrations



1) HYDRUS-[AERFUM unit simulation] coupling: to evaluate the effects of alternative application method on acute exposure
2) AERFUM coupling for unit-regional simulations: to evaluate the effects of acute mitigation options on long-term concentrations

Options for Addressing Acute Bystander Exposures

DPR is identifying options for consideration;
the specific combination of mitigation measures is intended for discussion at this workshop.

- Continue to prohibit all 1,3-D applications during December
- Require tarps
- Require a Field Management Plan (FMP) for every application
- Incorporate current fumigant Phase II label requirements including: Emergency Preparedness, Response, and Difficult to Evacuate Site
- Cap Application Blocks to a **maximum of 40 acres**
- Require a permanent distance to an Occupied Structure of **200 ft**
- For two or more applications, if the application times are within **96 hours** or their application blocks are **within 800 ft**., their combined acreage **shall not exceed 40 acres**
- ***Additional Field Fumigation Method (FFM) specific mitigation options:***
  - *Buffer zone distances and durations, maximum application rates, longer TIF tarp cut times, increased soil moisture requirement or other new reduced-emission application methods*

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Selected Estimated Buffer Zone Distances and Duration

FFM	Description	Buffer Zone Distance (Rate = 332 lbs/acre) Target = 55 ppb		Buffer Zone Distance (Rate = 332 lbs/acre) Target = 110 ppb	
		Buffer distance (ft)	Buffer duration (day)	Buffer distance (ft)	Buffer duration (day)
1201	Shallow/Broadcast or Bed/Non-Tarp	3,540	5.2	1,907	3.5
1206	Deep/Broadcast or Bed/Non-Tarp	1,919	6.4	1,001	4.4
1242	Shallow/Broadcast/TIF	62	1.7	23	0.7

FFM 1201: FFM with the highest estimated 1,3-D emissions
FFM 1206: Most popular 1,3-D application method overall
FFM 1242: Most popular 1,3-D application method using a Totally Impermeable Film (TIF)

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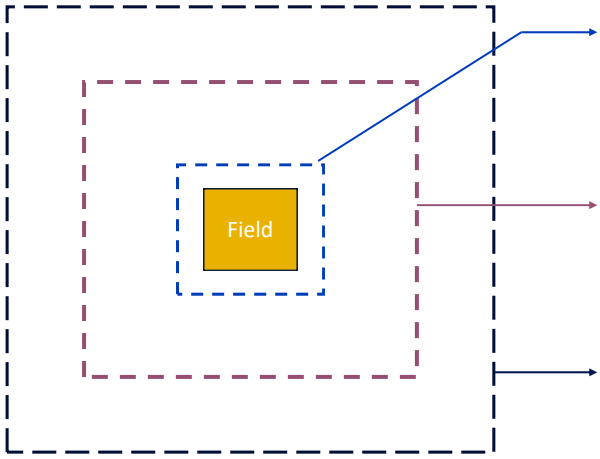
Selected Estimated Buffer Zone Distances and Duration

FFM 1206 (Deep/Broadcast or Bed/Non-Tarp)*: Most popular 1,3-D application method overall*



Current mitigation (Rate = 332 lbs/acre)
- **100 Feet** buffer distance
- **7 days** buffer duration

Using 110 ppb reference target (Rate = 332 lbs/acre)
- **1,001 Feet** buffer distance
- **4.4 days** buffer duration

Using 55 ppb reference target (Rate = 332 lbs/acre)
- **1,919 Feet** buffer distance
- **6.4 days** buffer duration

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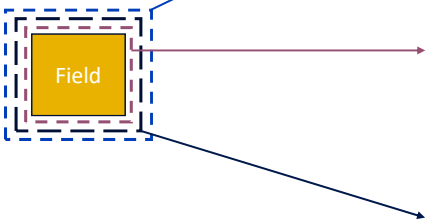
Selected Estimated Buffer Zone Distances and Duration

FFM 1242 (Shallow/Broadcast/TIF)*: Most popular 1,3-D application method using a Totally Impermeable Film (TIF)*



Current mitigation (Rate = 332 lbs/acre)
- **100 Feet** buffer distance
- **7 days** buffer duration

Using 110 ppb reference target (Rate = 332 lbs/acre)
- **23 Feet** buffer distance
- **0.7 days** buffer duration

Using 55 ppb reference target (Rate = 332 lbs/acre)
- **62 Feet** buffer distance
- **1.7 days** buffer duration

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Selected Estimated Maximum Application Rates

FFM	Description	Maximum application rate (lb/ac), BZ=200 or 500 ft for 7 d and a target concentration of 55 ppb		Maximum application rate (lb/ac), BZ=200 or 500 ft for 7 d and a target concentration of 110 ppb	
		200ft	500ft	200ft	500ft
1201	Shallow/Broadcast or Bed/Non-Tarp	41.7	62.7	83.5	125.5
1206	Deep/Broadcast or Bed/Non-Tarp	98.2	141.4	196.5	288.4
1242	Shallow/Broadcast/TIF	332	332	332	332

FFM 1201: FFM with the highest estimated 1,3-D emissions
FFM 1206: Most popular 1,3-D application method overall
FFM 1242: Most popular 1,3-D application method using a Totally Impermeable Film (TIF)

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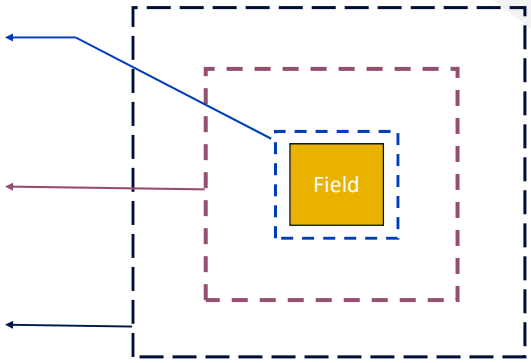
Selected Estimated Maximum Application Rates

FFM 1206 (Deep/Broadcast or Bed/Non-Tarp)*: Most popular 1,3-D application method overall*

Current mitigation
- **332 lbs/ac** can be applied with **100 ft** buffer zone.

At **200 ft** buffer zone, the maximum application rate
- **196.5 lbs/ac** using 110 ppb reference target
- **98.2 lbs/ac u**sing 55 ppb reference target

At **500 ft** buffer zone, the maximum application rate
- **288.4 lbs/ac** using 110 ppb reference target
- **141.4 lbs/ac u**sing 55 ppb reference target



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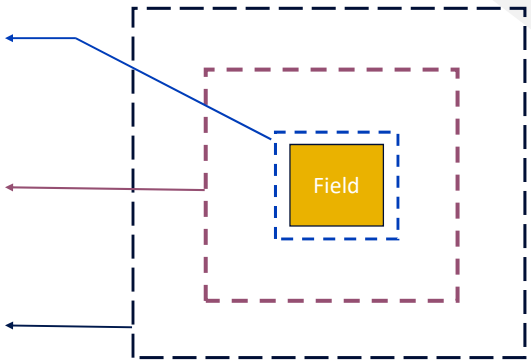
Selected Estimated Maximum Application Rates

FFM 1242 (Shallow/Broadcast/TIF)*: Most popular 1,3-D application method using a Totally Impermeable Film (TIF)*

Current mitigation
- **332 lbs/ac** can be applied with **100 ft** buffer zone.

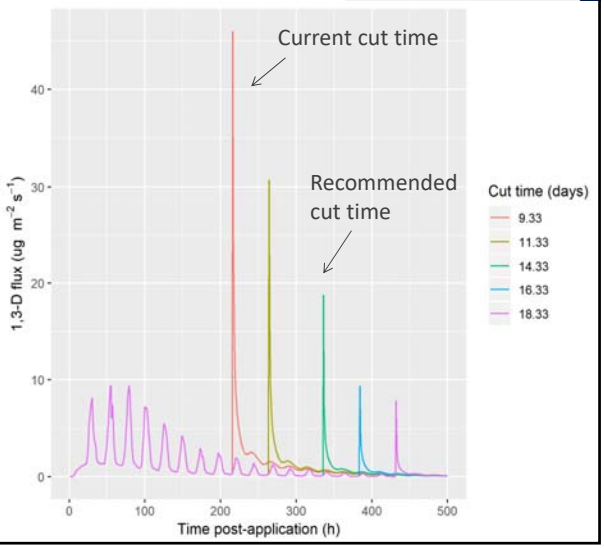
At **200 ft** buffer zone, the maximum application rate
- **332 lbs/ac** using 110 ppb reference target
- **332 lbs/ac u**sing 55 ppb reference target

At **500 ft** buffer zone, the maximum application rate
- **332 lbs/ac** using 110 ppb reference target
- **332 lbs/ac u**sing 55 ppb reference target



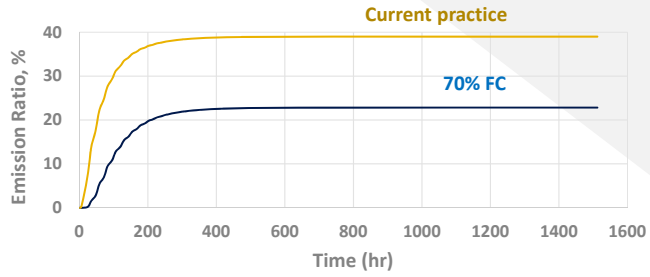
Possible Mitigation Option: Longer TIF Cut Times

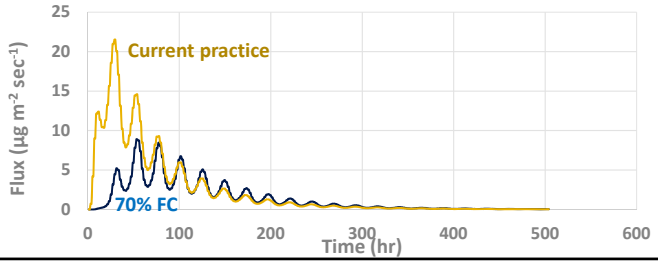
- HYDRUS and AERFUM were used in combination to determine the holding period necessary to reduce acute exposure to below the level of concern.
- A change from a 9 day to a **14 day** tarpcut is recommended to ensure that the tarpcut occurs after most of the fumigant has dissipated.
  - Over 50% lower emissions at tarpcut than current 9 day requirement.



Possible Mitigation Option: Increased Initial Soil Moisture

- Comparison of **emission rate** (flux) between measured initial soil moisture (current practice) and initial soil moisture of 70% field capacity (**FC**).
  - Benefits:
    - Allow growers/applicators flexibility with untarped application methods.
  - Challenges:
    - Difficult to measure moisture content real-time
    - Will increase water consumption by grower.
    - Since the higher soil moisture restricts the movement of the fumigant in the soil, a reduction in efficacy may be experienced.





Considerations

- 1,3-D is extensively used:
  - Annual average of 12.6 million pounds applied (2011-2015).
- Growers transitioned to using more 1,3-D as methyl bromide was phased out;
  - There are currently no viable commercial-scale alternatives to 1,3-D.
- Proposed mitigation measures could be costly:
  - DPR is working with CDFA to determine costs associated with mitigation options.
- Goal to address acute health risks.

Implementation Timelines

- DPR is aiming to notice a permanent rulemaking addressing acute and cancer exposures from 1,3-D next summer.
- DPR is evaluating interim mitigation measures for acute effects of 1,3-D.
  - These mitigation measures may include similar requirements to those we anticipate for permanent regulations.
  - These may be in place by early next year.

Public Comments

- DPR is proposing to mitigate acute exposures of 1,3-D to bystanders.
- DPR is seeking feedback on the following:
  1. Proposed mitigation
     - Feasibility and efficacy of buffer zones and application rates
     - Feasibility and efficacy of new methods
     - Feasibility of requiring TIF tarps
     - Other measures to consider
  2. Timing and scope of implementation and factors DPR should consider.
  3. Economic impact and environmental tradeoffs of proposed mitigation.

Supporting Slides

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Estimated Buffer Zone Distances and Duration

FFM	Description	Buffer Zone Distance (Rate = 332 lbs/acre) Target = 55 ppb		Buffer Zone Distance (Rate = 332 lbs/acre) Target = 110 ppb	
		Buffer distance (ft)	Buffer duration (day)	Buffer distance (ft)	Buffer duration (day)
1201	Shallow/Broadcast or Bed/Non-Tarp	3,540	5.2	1,907	3.5
1202	Shallow/Broadcast/Non-TIF Tarp	2,409	5.0	1,239	3.2
1203	Shallow/Bed/Non-TIF Tarp	3,000	4.6	1,560	3.2
1204	Shallow/Broadcast or Bed w/ 3x Irrigation/Non-Tarp	2,347	5.3	1,186	3.7
1205	Shallow/Bed w/ 3x Irrigation/Non-TIF Tarp	2,747	4.6	1,419	3.0
1206	Deep/Broadcast or Bed/Non-Tarp	1,919	6.4	1,001	4.4
1207	Deep/Broadcast/Non-TIF Tarp	1,260	5.7	642	4.2
1209	Chemigation/Bed/Non-TIF Tarp	1,973	3.6	980	2.2
1210	Deep/Strip/Non-Tarp	1,825	6.9	941	4.7
1211	Deep/GPS targeted/Non-tarp	1,919	6.4	1,001	4.4
1242	Shallow/Broadcast/TIF	62	1.7	23	0.7
1243	Shallow/Bed/TIF	726	3.9	346	2.6
1245	Shallow/Bed w/ 3x Irrigation/TIF	319	3.4	118	2.1
1247	Deep/Broadcast/TIF	121	4.0	92	2.8
1249	Deep/Strip/TIF	93	3.8	44	1.8
1259	Chemigation/Bed/TIF	480	3.0	205	1.9
1290	Other label method	3,540	5.2	1,907	3.5

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Estimated Maximum Application Rates

FFM	Description	Maximum application rate (lb/ac), BZ=200 or 500 ft for 7 d and a target concentration of 55 ppb		Maximum application rate (lb/ac), BZ=200 or 500 ft for 7 d and a target concentration of 110 ppb	
		200ft	500ft	200ft	500ft
1201	Shallow/Broadcast or Bed/Non-Tarp	41.7	62.7	83.5	125.5
1202	Shallow/Broadcast/Non-TIF Tarp	70.5	106.1	140.9	212.5
1203	Shallow/Bed/Non-TIF Tarp	51.9	78.5	103.8	157.2
1204	Shallow/Broadcast or Bed w/ 3x Irrigation/Non-Tarp	69.7	105.3	139.3	211.1
1205	Shallow/Bed w/ 3x Irrigation/Non-TIF Tarp	56.6	85.6	113.2	171.5
1206	Deep/Broadcast or Bed/Non-Tarp	98.2	141.4	196.5	288.4
1207	Deep/Broadcast/Non-TIF Tarp	165	223.8	332	332
1209	Chemigation/Bed/Non-TIF Tarp	75.9	116.3	151.9	232.9
1210	Deep/Strip/Non-Tarp	106	146.7	213.2	303.5
1211	Deep/GPS targeted/Non-tarp	98.2	141.4	196.5	288.4
1242	Shallow/Broadcast/TIF	332	332	332	332
1243	Shallow/Bed/TIF	233.8	331.5	332	332
1245	Shallow/Bed w/ 3x Irrigation/TIF	325.8	332	332	332
1247	Deep/Broadcast/TIF	332	332	332	332
1249	Deep/Strip/TIF	332	332	332	332
1259	Chemigation/Bed/TIF	254.5	332	332	332
1290	Other label method	41.7	62.7	83.5	125.5