



October 15, 2018

Dear Secretary Ross,

On behalf of the organizations listed below, we write to express grave concern about the proposal to include Nitrification Inhibitors (NIs) and Slow-Release Fertilizers (also known as Controlled Release Fertilizers, or CRFs) in the state's Healthy Soils Incentives program.

This proposal threatens to undermine the integrity of the program that CDFA and many stakeholder groups have worked so diligently to stand up and promote. This proposal also threatens to undermine the role of the Environmental Farming Act Science Advisory Panel (EFA-SAP) and its accompanying public process.

We strongly recommend that CDFA retract this proposal for three reasons, which we explain in detail below:

1. NIs and CRFs do not have a soil health benefit and thus do not comply with the statutory requirement that practices in the Healthy Soils Program contribute to healthy soils, as defined in statute.
2. There is insufficient scientific evidence on the GHG impacts of NIs and CRFs to justify a statewide incentive in all of California's climate zones and cropping and irrigation systems.
3. The proposal circumvents both the EFA-SAP's role in advising the program and the nearly year-long public process to add new practices to the program.

1. NIs and CRFs Do Not Meet the Statutory Requirement for a Soil Health Benefit

The Healthy Soils program is intended to increase carbon sinks in agricultural lands, reduce related emissions, and, as its name so clearly implies, make soils healthier. The proposed addition of NIs and CRFs fails to meet this basic requirement of the program. To be eligible for

the Healthy Soils program, a management practice should, according to the statute: “contribute to healthy soils *and* result in net long-term on-farm greenhouse gas benefits.”¹ Healthy Soils are defined in statute as “soils that enhance their continuing capacity to function as a biological system, increase soil organic matter, improve soil structure and water- and nutrient-holding capacity, and result in net long-term greenhouse gas benefits.”²

NIs and CRFs do not increase soil’s continuing capacity to function as a biological system, increase organic matter, or improve soil structure or the water-and-nutrient holding capacity of the soil. Every other Healthy Soils practice has well-documented soil health benefits.

In light of stakeholders’ consistent concerns about adding NIs and CRFs to the program, expressed through letters and in public comments at five EFA-SAP meetings over the past eleven months, the burden of proof is on CDFA to justify why NIs and CRFs should be added, including scientific evidence documenting their soil health benefits in all climate zones, soil types, and cropping and irrigation systems present in California. Despite eleven months of discussion about NIs and CRFs, including direct questions about their lack of soil health benefits during public comments as far back as the January 18, 2018 EFA-SAP meeting, we have yet to see any analysis from CDFA supporting this proposal.

2. NIs and CRFs Do Not Have Sufficient Evidence of GHG Impacts

NIs and CRFs are often referred to as Enhanced Efficiency Fertilizers (EEFs) in the scientific literature. While certain meta-analyses (e.g. Akiyama, 2010³) point to the potential for EEFs⁴ to reduce N₂O emissions on a global scale, **limited research has been done on EEFs in California’s unique and diverse agricultural context.** Given the key role edaphic factors have on EEF efficacy,⁵ it is important to have research specific to California’s climates, soils, and cropping and irrigation systems.

Additionally, **the conclusions of many studies on EEFs and GHG emissions have been called into question.** The California Nitrogen Assessment states, “...the results of the research on EEFs and N₂O may be confounded by experimental design. Some evidence suggests that although EEFs present lower initial fluxes, N₂O production may extend for longer periods and

¹ FAC Div. 1, Ch. 3, Article 8.5, Section 569(a)(1). Emphasis added.

² FAC Div. 1, Ch. 3, Article 8.5, Section 569(e)(2).

³ Akiyama H, Yan X, Yagi K. Evaluation of effectiveness of enhanced-efficiency fertilizers as mitigation options for N₂O and NO emissions from agricultural soils: meta-analysis. *Global Change Biology*. 2010;16: 1837-1846. Available from: <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2486.2009.02031.x/abstract;jsessionid=EDCC390BECAFEA8C14C3495A0E6399E6.f04t01>

⁴ It is important to note that a wide range of EEFs are available in the marketplace and their mode of action in the soil is different.

⁵ Steenwerth K, Hodson A, Bloom A, Carter M, Cattaneo A, Chartres C, Hatfield J, Henry K, Hopmans J, Horwath W, Jenkins B, Kebreab E, Leemans R, Lipper L, Lubell M, Msangi S, Prabhu R, Reynolds M, Solis S, Sisco W, Springborn M, Tiftonell P, Wheeler S, Vermeulen S, Wollenberg E, Jarvis L, Jackson L. Climate-smart agriculture global research agenda: scientific basis for action. *Agriculture & Food Security*. 2014;3(11). Available from: <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/2048-7010-3-11>

therefore may show higher total losses (Delgado and Mosier, 1996) or similar total annual losses (Parkin and Hatfield, 2010) when compared to fertilizer application without NIs.”⁶

Moreover, Lam et al. (2016) suggests that **NIs may be much less effective than previously thought when both direct and indirect emissions are taken into account.**⁷ After reviewing the limited studies available that took into account both direct and indirect N₂O emissions (from increased ammonia volatilization, subsequent deposition and N₂O emissions), they write: “Our results suggest that the beneficial effect of NIs in decreasing direct N₂O emissions can be undermined or even outweighed by an increase in NH₃ volatilization.”⁸ Furthermore, simply switching from conventional fertilizers to EEFs will not reduce the energy use associated with the Haber-Bosch process and transport of fertilizers.⁹

The limited research on EEFs in California has shown mixed results based on specific combinations of fertilizers, inhibitors, crops, and irrigation methods. For example, in tests of the dicyandiamide (DCD) nitrification inhibitor, the inhibitor reduced N₂O emissions by more than 60% in two out of three years of a furrow irrigated corn trial, but the inhibitor had no effect in one out of the three years.¹⁰ In subsurface drip-irrigated tomato systems, the effect of the DCD inhibitor on N₂O emissions was small overall and differed significantly between the two years of the trial.¹¹ The efficacy of inhibitors has also been found to vary significantly by fertilizer source in California experiments.¹²

In micro-irrigation systems (which are used to irrigate 41% of California cropland) the results of EEFs are less impressive, likely due to the increased efficiency of fertilization by fertigation.¹³ Subsurface drip irrigation by itself has been shown to reduce N₂O emissions more consistently

⁶ Rosenstock T, Brodt S, Burger M, Leverenz H, Meyer D. 2016. Appendix 7.1: Technical options to control the nitrogen cascade in California agriculture. In: The California Nitrogen Assessment. Available from: <http://asi.ucdavis.edu/programs/sarep/research-initiatives/are/nutrient-mgmt/california-nitrogen-assessment/appendices-and-supplemental-information-1/ch7-appendix-7-1-final.pdf>

⁷ Lam S, Suter H, Mosier A, Chen D. Using nitrification inhibitors to mitigate agricultural N₂O emission: a double-edged sword? *Global Change Biology*. 2017;23(2): 485-489. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/27144727>

⁸ Ibid.

⁹ Sutton M, Oenema O, Erisman J, Leip A, van Grinsven H, Winiwarter W. Too much of a good thing. *Nature*. 2011;472: 159–161. Available from: <https://www.nature.com/articles/472159a>

¹⁰ Burger M, Horwath W, Six J. 2016. Evaluating Mitigation Options of Nitrous Oxide Emissions in CA Cropping Systems. Report for the California Air Resources Board. Available from: www.arb.ca.gov/research/single-project.php?row_id=65096

¹¹ Ibid.

¹² Waterhouse H, Wade J, Horwath W, Burger M. Effects of Positively Charged Dicyandiamide and Nitrogen Fertilizer Sources on Nitrous Oxide Emissions in Irrigated Corn. *Journal of Environmental Quality*. 2017;46(5): 1123–1130. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/28991971>

¹³ Steenwerth K, Hodson A, Bloom A, Carter M, Cattaneo A, Chartres C, Hatfield J, Henry K, Hopmans J, Horwath W, Jenkins B, Kebreab E, Leemans R, Lipper L, Lubell M, Msangi S, Prabhu R, Reynolds M, Solis S, Sicho W, Springborn M, Tiftonell P, Wheeler S, Vermeulen S, Wollenberg E, Jarvis L, Jackson L. Climate-smart agriculture global research agenda: scientific basis for action. *Agriculture & Food Security*. 2014;3(11). Available from: <https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/2048-7010-3-11>

than any other EEF treatment.¹⁴ Consequently, it is important to note that California cropland irrigation methods significantly trended away from surface irrigation (-37%) and towards drip/micro irrigation (+38%) between 1972-2010 in California, such that 43% of irrigated cropland is now irrigated by surface irrigation and 41% by micro/drip, with the remainder (15%) irrigated by sprinkler.¹⁵

In a study that monitored the efficiency of CRFs across three strawberry fields (with randomized block experimental design and four replicates per CRF rate) in Salinas, Watsonville, and Castroville, Hartz et al. found that the rate of N release was much faster than the rate of strawberry N uptake and that CRF had minimal effect on crop N uptake.¹⁶ They also found that reducing CRF or eliminating it altogether did not affect marketable fruit yield for two out of the three sites.¹⁷ These results led them to conclude that current CRF use patterns are not efficient, and that reducing overall CRF rates could be done with minimal risk to crop productivity.¹⁸ They write “Rather than routinely using high preplant CRF rates to protect against such unusually high winter rainfall or inefficient irrigation, a program of more accurate irrigation scheduling, soil NO₃-N testing in the spring, and earlier fertigation (where appropriate) would be a more nitrogen efficient practice.”¹⁹

Recognizing these uncertainties and California agriculture’s unique climates, diversity of crops, and advances in irrigation systems, the California Nitrogen Assessment states:

“Under current farming conditions, however, it is not clear if EEFs will produce comparable benefits in California as in other regions where they are being promoted. Benefits of EEFs are maximized when periodic and uncontrolled soil moisture decrease control of N, conditions only found during winter in some parts of California agricultural valleys. The more common production conditions—hot, dry, and fertigated—can provide equivalent or greater control of nutrients if managed astutely.”²⁰

¹⁴ Burger M, Horwath W, Six J. 2016. Evaluating Mitigation Options of Nitrous Oxide Emissions in CA Cropping Systems. Report for the California Air Resources Board. Available from: www.arb.ca.gov/research/single-project.php?row_id=65096

¹⁵ Tindula G, Orang M, Snyder R. Survey of Irrigation Methods in California in 2010. Journal of Irrigation and Drainage Engineering. 2013;139(3). Available from: http://www.water.ca.gov/waterplan/docs/cwpu2013/Final/vol4/crop_water_use/21Survey_Irrigation_Methods_2010_CA.pdf

¹⁶ Hartz T, Bottoms T, Cahn M, Farrara B. Improving nitrogen use in strawberry production. University of California Cooperative Extension – Monterey County. 2013. Available from: <http://cemonterey.ucanr.edu/files/170996.pdf>

¹⁷ Ibid.

¹⁸ Ibid.

¹⁹ Ibid.

²⁰ Rosenstock T, Brodt S, Burger M, Leverenz H, Meyer D. 2016. Appendix 7.1: Technical options to control the nitrogen cascade in California agriculture. In: The California Nitrogen Assessment. Available from: <http://asi.ucdavis.edu/programs/sarep/research-initiatives/are/nutrient-mgmt/california-nitrogen-assessment/appendices-and-supplemental-information-1/ch7-appendix-7-1-final.pdf>

CDFA itself wrote in its July 17, 2018 EFA-SAP meeting presentation (slides below) that NIs and CRFs had “Insufficient published peer-reviewed research literature to demonstrate soil C sequestration in varying CA climate zones and soil types.”

<p>II. Recommended for Inclusion in 2018 HSP Demonstration Projects with Research (Type A)</p> <p>590 Nutrient Management: Slow release fertilizers</p> <p>Improved nitrogen management by use of slow release nitrogen fertilizers. Slow release fertilizers release nutrients into the soil gradually, which results in lower N losses from cropland soils.</p>	<p><u>Status:</u> Insufficient published peer-reviewed research literature to demonstrate soil C-sequestration in varying CA climate zones and soil types.</p> <p><u>Verification Method:</u> Quarterly progress reports including research findings and field-site visits.</p>
<p>II. Recommended for Inclusion in 2018 HSP Demonstration Projects with Research (Type A)</p> <p>590 Nutrient Management: Nitrification Inhibitors.</p> <p>Improved nitrogen management planning by use of nitrification inhibitors. Nitrification inhibitors slow the nitrification of ammonia, ammonium-containing, and urea-based fertilizers, which results in lower N losses from cropland soils.</p>	<p><u>Status:</u> Insufficient published peer-reviewed research literature to demonstrate soil C-sequestration in varying CA climate zones and soil types.</p> <p><u>Verification Method:</u> Quarterly progress reports including research findings and field-site visits.</p>

We wholeheartedly concur. NIs and CRFs do not yet have sufficient California-relevant evidence or agreement within the literature to merit a statewide incentive.

3. This Proposal Circumvents the EFA-SAP’s Advisory Role and the Nearly Year-Long Public Process to Add New Practices to the Program

With the latest proposal to add NIs and CRFs, CDFA is contradicting its own statements (e.g. “NIs and CRFs have insufficient published peer-reviewed research literature...”) from EFA-SAP meetings in May and July, and is reversing course on a decision the EFA-SAP made to approve the proposed list of practices on July 17, 2018—a decision that had been arrived at after five EFA-SAP meetings to discuss proposed practices and a written public comment period specifically on the proposed practices between May 29 - June 19, 2018. We have documented

the timeline of these EFA-SAP member and public comments and letters in detail in the Appendix.

The only thing that appears to have prompted this surprising turnaround is a letter from a representative of an association of companies that make and sell NIs and CRFs, submitted two days before the public comment deadline (September 12) on the draft RGA (*not* the proposed practices). This was the only letter or public comment submitted in 11 months that supported NIs and CRFs, and it came from a representative of an industry that stands to directly financially gain from having their products incentivized in the Healthy Soils Program.

The only justification CDFA has provided for its reversal is: “Practices are already included in Comet Planner under CPS 590, Nutrient Management.” But that has been true throughout this nearly year-long process and did not prevent CDFA from concluding there was “insufficient published peer-reviewed research literature...” in July, when the EFA-SAP approved the proposed practices.

In sum, the proposal to add NIs and CRFs fails to meet the programs’ statutory requirements, is based on insufficient scientific evidence, and dismisses both EFA-SAP members’ and stakeholders’ roles, consistently communicated questions and concerns, and requests for transparency in a nearly year-long public process.

We ask that CDFA retract this proposal to protect the integrity of the program and uphold the role of the EFA-SAP and its accompanying public process. Further, we request an evaluation of how the EFA-SAP’s public processes are managed.

Sincerely,

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Dave Runsten
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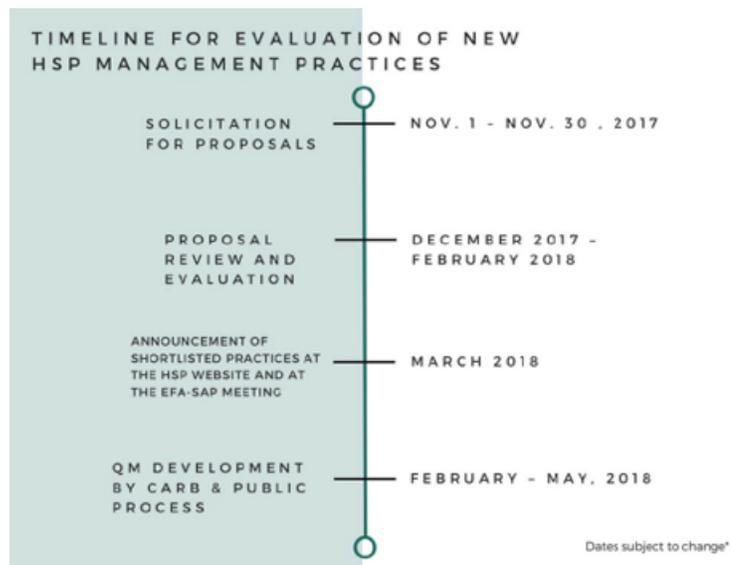
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Appendix: Timeline and Summary of the Public Process to Evaluate New Healthy Soils Practices

The image to the right was CDFA's original timeline for the evaluation of proposed management practices, as presented at the October 26, 2017 EFA-SAP meeting.

Below is a brief summary of how this timeline and process has actually proceeded, noting specific moments related to the discussion of NIs and CRFs:



Oct. 26, 2017 EFA-SAP Mtg: CDFA announces it will solicit public proposals for additional practices, but states NIs and CRFs will automatically be included in the list of practices to consider.

Stakeholders ask if CDFA will submit a proposal for NIs and CRFs as is required for every other practice. CDFA says no. Stakeholders ask if an independent body will review proposals to avoid a conflict of interest. CDFA says no, stating that it has the expertise in-house to do it fairly.

Nov-Dec, 2017 - CDFA Accepts Proposals for Practices: No public proposal is submitted on behalf of NIs and CRFs. No proposal from CDFA for NIs or CRFs is included in the published proposals. One stakeholder proposal specifically opposes NIs and CRFs, citing numerous California-based studies and reports.

Jan. 19, 2018 EFA-SAP Mtg: CDFA indicates it has not evaluated the proposals, and still includes NIs and CRFs in its list. **EFA-SAP members and stakeholders directly question why NIs and CRFs were included, ask CDFA to cite evidence regarding their soil health benefit, and request clear criteria for how practices are to be evaluated.**

Mar. 15, 2018 EFA-SAP Mtg: CDFA sorts proposed practices into four confusing categories (e.g. "Ongoing considerations") with no written explanation and only brief verbal explanation. Public comments again raise questions about NIs and CRFs.

May 24, 2018 EFA-SAP Mtg: CDFA lists NIs as "Not considered for next round... due to stakeholder concerns related to lack of CA-based data." Stakeholders again raise concerns about limited and lackluster research on CRFs. **CDFA initially says there will be no public comment period on the final list of practices**, because the practices had been publicly submitted in November [Note: *except* NIs and CRFs]. **Several EFA-SAP members then**

request to have a public comment period on the practices and to receive those comments before the next EFA-SAP meeting. CDFA then agrees.

May 25, 2018: Four stakeholder organizations send a letter to Secretary Ross. The letter notes: “There is a lack of transparency on the scientific basis for certain Healthy Soils practice guidelines... We also have concerns about the lack of transparency in the inclusion of slow release fertilizers. **CDFA has failed to offer any scientific justification (e.g. literature review, examples of studies) that demonstrates the efficacy of slow release fertilizer use in California and its ability to reduce greenhouse gas emissions and increase carbon sequestration.**” The letter recommends: “CDFA should publish criteria for how the department will determine the inclusion or exclusion of practices in the Healthy Soils program,” and “**Slow release fertilizers should not be allowed into the program without justification, including a literature review on the efficacy of the practice in California.**” [Note: The authors assumed NIs were no longer being considered based on the May 24, 2018 presentation at the EFA-SAP.]

May 29 - June 19, 2018: CDFA accepts public comments on the proposed practices. **No public comments are received in support of NIs and CRFs. A letter on behalf of 14 stakeholder groups recommends rejecting NIs and CRFs,** citing specific California-based studies and reports and noting that strawberries are the only crop in California where CRFs are currently the industry standard. [Note: The authors assumed NIs were no longer being considered based on the May 24, 2018 presentation at the EFA-SAP.]

July 17, 2018 EFA-SAP Mtg: CDFA tells the EFA-SAP they are recommending NIs and CRFs *solely* for Type A Demonstration and Research projects because there is “insufficient published peer-reviewed research literature to demonstrate soil C sequestration in varying CA climate zones and soil types,” and Type A projects will allow the GHG impacts of NIs and CRFs to be more rigorously researched in California. **The EFA-SAP approves the list of proposed practices to be included in the draft RGA.**

July 30 - September 12, 2018: CDFA solicits written public comments on its draft RGA. **The draft RGA does not include NIs or CRFs as proposed practices in the Incentives Program.**

September 10, 2018: For the first time in this now eleven-month process, a letter is submitted in support of NIs and CRFs; **the letter is submitted by a fertilizer industry trade group, whose members would directly profit from NIs and CRFs being added to the program.**

October 8, 2018: CDFA announces it is proposing to add NIs and CRFs to the Incentives program, with no more explanation than: “Practices are already included in Comet Planner under CPS 590, Nutrient Management,” which has always been the case, so is nothing new and no justification.