Fertilizer Research and Education Program

Final Report

A. Project Information

Project Title: Developing a nitrogen mineralization model for organically managed vegetable farms on the Central Coast
Project leaders: Joji Muramoto, Richard Smith, Michael Cahn, and Daniel Geisseler
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Email and Phone (Lead PI): jmuramoto@ucanr.edu, 831-459-2178
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B. Abstract

Organic production continues to expand in California, given the optimal climatic conditions and increasing consumer demand. Current fertility practices among organic growers vary widely, and science-based nitrogen (N) management is rarely used. CropManage (CM) is an online irrigation and N management decision-support tool with more than 1,700 registered users. However, CM currently cannot simulate N mineralization from organic fertilizers or amendments. This project aims to integrate a simple N mineralization model with CM to provide fertilizer recommendations for organic vegetable production. This project aimed to 1) create a N mineralization database for organic fertilizers and amendments, crop residues, and soil organic matter (SOM), 2) develop a simple N mineralization model using the existing data, 3) evaluate and improve the simple model by field trials and incubation studies, 4) integrate the selected model with CM to simulate N mineralization in organic vegetable production in Coastal California, and 5) conduct outreach to organic vegetable growers in Coastal California. We compiled existing data on N mineralization from literature and past studies on organic fertilizers and amendments, crop residues, and soil organic matter. Using 113 datasets from peer-reviewed articles, a two-pool N mineralization model was developed and published in the Journal of Environmental Quality. N mineralization for two soy-protein hydrolysate fertilizers, a liquid organic fertilizer, and local crop residues of strawberry, Brussels sprout, and artichoke were examined by laboratory incubation. Two replicated field trials were conducted to evaluate the model. The model's prediction of N mineralization from organic fertilizers under field conditions appeared reasonable, though the field-trial data were highly variable. The integration of the N mineralization model into CM has completed, and a demonstration version is available. The outcomes of this project were disseminated at 24 outreach events to about 1,200 people.

C. Introduction

Organic vegetable production on the Central Coast (Monterey, Santa Cruz, and San Benito Counties) was valued at $390 million in 2017. Organic production continues to expand, driven by optimal climatic conditions in this area and increasing consumer demand. Science-based information on nitrogen (N) management is rarely applied in organic fertilizer programs. Current fertility practices vary widely among growers, which has both economic and environmental ramifications. Further, growers are now required to estimate mineralization rates to complete the mandatory N management plans submitted to the Regional Water Quality Control Board. Still, there is insufficient information on N mineralization of organic fertilizers and amendments under local conditions to do so in an informed way.

CropManage (CM) is an online irrigation and N management decision-support tool originally developed under FREP funding in 2011 and now with more than 1700 registered users. In recent years, the online advisory service has provided more than 1,000 recommendations per month during the production season to vegetable and berry growers, mainly farming in California's coastal valleys. Though initially developed for lettuce, continued research and funding have expanded CM to include other leafy greens (spinach, mizuna, leaf lettuce), cole crops (broccoli, cabbage, and cauliflower), celery, peppers, raspberries, and strawberries. However, CM currently cannot simulate N mineralization from organic fertilizers or amendments.

D. Objectives

The objectives are to:

1) create a N mineralization database for organic fertilizers and amendments, crop residues, and soil organic matter (SOM),

2) develop a simple N mineralization model using the existing data,

3) evaluate and improve the simple model by field trials and incubation studies,

4) integrate the selected model with CM to simulate N mineralization in organic vegetable production in Coastal California, and

5) conduct outreach to organic vegetable growers in Coastal California.

E. Methods

Objective 1:

Task 1.1: Existing data on N mineralization rates of soils, organic fertilizers and amendments, and crop residues, including cover crops that are relevant to local organic vegetable production, were compiled from the literature and past local studies, including one from a FREP-funded organic fertilizer project.

Task 1.2: We identified data gaps that require additional incubation studies, including N mineralization from residues of artichoke, Brussels sprout, and strawberry crops, and soy protein hydrolysate fertilizer (SPHF).

An incubation trial of two SPHFs (N: 14.7-16.3% as is. Carbon: nitrogen (CN) ratio: 2.3 – 2.8) and liquid organic fertilizer (N: 2.39% w/w, CN ratio: 7.0. Derived from corn steep liquor and fermented fish by-products) was conducted for 12 weeks using a sandy loam soil with 60% water-filled pore space moisture condition at 25 °C with 4 replications. SPHFs are water-soluble. Thus, their N mineralization was evaluated in 2 forms: as-is (solid) and dissolved in water.

For strawberry plant residues, four commercial fields growing different popular strawberry varieties in Watsonville and Salinas were identified, and four above-ground plants were randomly sampled from each field near the end of the harvest season in October 2021. Any marketable fruits on the plants were removed. To simulate the mowing process in actual fields, fresh leaves, petioles, and crowns were roughly chopped with a knife and then homogenized in a food processor. Based on plant density and plant biomass (Table 1.1), the actual amount of residue biomass (T/A) was calculated for each field, and the residues were incorporated at a rate of 1.04 kg (oven-dry soil) in sandy loam soil. The soil, with and without residues, was prepared for each variety, with 4 replications, and incubated at 60% of water-filled pore space in a sealable plastic container (2-liter volume) with a pin hole at 25 °C in a humidified incubator.

Table 1.1. Biomass N in strawberry plant residues collected for the incubation trial.

#	Variety	Org /Conv	Planting month	Marketable yield lb/A	Plant density /A	Dry biomass T/A	C N	Total N lb-N/A	Mineralizable N in 24 weeks lb-N/A
1	Albion	Organic	Nov.2020	46,072	21,541	3.53	29	110	34.7
2	Proprietary 1	Conv.	Nov.2020	89,280	14,191	4.56	30	131	43.6
3	Proprietary 2	Conv.	Nov.2020	108,224	14,191	3.99	34	106	33.8
4	Monterey	Conv.	Oct.2020	64,000	13,403	3.63	26	103	33.4

Soil samples were taken for inorganic N analysis at 0, 1, 2, 4, 8, 12, 16, 20, and 24 weeks, and the N mineralization rate of strawberry residues y at week i was calculated as follows;

Mineralized Nyi (%) = (Inorg Nyi – Inorg Nci) / Total Ny x 100

where Inorg Nyi = inorganic N content (mg-N/kg dry soil) at variety y at week i, Inorg Nci = inorganic N content at Control (no residues) at week i, and Total Ny = total N amount added by variety y to 1 kg of dry soil in the container.

For Brussels sprouts, three commercial Brussels sprout fields that were ready to harvest were identified in Santa Cruz and Half Moon Bay, and four above-ground plants were randomly sampled from each field in Dec. 2021. After removing marketable sprouts, fresh leaves, stems, and unmarketable sprouts were chopped with a knife and then homogenized using a food processor. The rest of the process was the same as the strawberry residues experiment above, except the incubation was halted at 20 weeks since no increase in N mineralization was observed at that point. See Table 1.2 for Brussels sprout field information.

Table 1.2. Biomass N in Brussels sprout residues collected for the incubation trial.

#	Variety	Org/Conv	Planting month	Marketable yield T/A	Plant density /A	Dry biomass T/A	C N	Total N lb-N/A	Mineralizable N in 20 weeks lb-N/A
1	Gigantus	Conv.	May 2021	14	14,520	4.32	16	210	85.2
2	Gradius	Conv.	July 2021	11	11,616	3.74	19	152	43.8
3	Gradius	Conv.	June 2021	11	13,403	3.34	24	109	19.1

For artichokes, residues from 3 commercial post-harvest fields were identified in Monterey County, and 4 above-ground plants were randomly sampled from the field from December 2023 to June 2024 (Table 1.3). After removing marketable heads, fresh leaves, stems, and unmarketable heads were chopped with a knife and then homogenized using a food processor. The rest of the process was the same as the strawberry residues experiment above and was conducted for 20 weeks.

Table 1.3. Biomass N in artichoke residues collected for the incubation trial.

#	Variety	Org. /Conv.	Planting month	Marketable yield T/A	Plant density /A	Dry biomass T/A	C N	Total N lb-N/A	Mineralized N in 20 weeks lb-N/A
1	Green Queen	Conv.	Dec. 2023	6.6	2,623	2.44	35	56	-3
2	Green Queen	Org.	May 2024	7.0	2,921	1.45	31	37	-2
3	F1-3713	Conv.	June 2024	4.9	2,538	1.44	23	51	3

Objective 2:

Task 2.1: A one-pool model was fit to the data from Objective 1 (Stanford and Smith, 1972):

$N_t = N_0 (1 - e^{(-kt)})$ Eq. 1

where Nt is N mineralized at time t (in days), N0 is the pool of mineralizable N, and k is the rate constant of mineralization.

The temperature response was calculated by fitting Eq. 2 to the data (De Neve et al., 1996).

$$FT=kopt\times e^{(-\kappa\times(1-T/Topt)^2)} \quad \text{Eq. 2}$$

where T is the measured soil temperature, FT is the temperature factor of the N mineralization rate at temperature T expressed as a fraction of the N mineralization rate at the reference temperature of 25 °C, kopt is the mineralization rate at optimum temperature, κ is a factor expressing the temperature sensitivity of FT, and Topt is the optimum temperature for N mineralization; it was set to 50 °C, based on Beck (1983). Values for κ and kopt was 3.523 and 241.9, respectively. These values are based on Miller and Geisseler (2018), who found that the temperature response of N mineralization from SOM did not differ significantly across regions in central and northern California.

The effect of soil moisture on N mineralization was calculated using Eq. 3.

$$FW=a\times RWC+b \quad \text{Eq. 3}$$

where RWC is the relative water content, and a and b are constants. Equation 4 was used to calculate RWC.

$$RWC=(\theta-\theta PWP)/(\theta FC-\theta PWP) \quad \text{Eq. 4}$$

where Θ is the volumetric moisture content, and ΘPWP and ΘFC are the volumetric moisture contents at the permanent wilting point (PWP) and field capacity (FC), respectively.

Based on 283 data points from 29 sites in the USA, Australia, and Argentina, Paul et al. (2003) found the best fit with values of 0.83 and 0.42 for a and b, respectively. Incubations at different moisture contents were carried out to validate and, if necessary, adjust these two values.

Objective 3:

Task 3.1: We completed two field trials in the Central Coast; one in an organic broccoli field (Trial A. Clear Lake clay, April - Aug. 2022) and another in an organic baby lettuce field (Trial B. Arroyo Seco gravelly sandy loam, Aug. – Sep. 2022).

For Trial A, the grower applied compost, pre-plant fertilizer, and two in-season fertilizers to grow an organic broccoli crop. Thus, a randomized complete block designed trial with no organic fertilizer (N0), crop residues (Nr), crop residues + compost (Nrc), crop residues + compost + preplant organic fertilizer (Nrcp), crop residues + compost + pre-plant + in-season organic fertilizers 1 (Nrcpi1), and crop residues + compost + pre-plant + in-season organic fertilizers 2 (Nrcpi2) as treatments was established with 4 replications. Each plot was 12 beds wide (40' wide) and 30' long, and the middle 5 beds

were used for soil and plant sampling. N mineralization from organic fertilizers and SOM was determined by monitoring soil inorganic N at 0'-1', 1'-2', and 2'-3' depths at pre-fertilization (baseline) and at four time points between planting and harvest in each plot. The N mineralization rate of SOM at each sampling time was determined as follows;

$$SOM\ N\ mineralization\ rate\ (\%) = \frac{Np0 + (Ns0t - Ns00)}{Nts}\ X\ 100$$

where Np0 = plant biomass N (lb/acre) in N0 treatment, Ns0t = soil inorganic N in 0'-3' depth (lb/acre) at N0 treatment at sampling time t, Ns00 = soil inorganic N in 0'-3' depth (lb/acre) at N0 treatment at sampling time 0 (baseline), Nts = soil total N in 0'-3' depth (lb/acre).

Crop biomass and biomass N were measured four times on the same or the next day, along with soil sampling, throughout the crop cycle, including at harvest. Soil bulk density was measured, and soil inorganic N content was calculated as lbs-N/acre for each depth. Net N mineralization rates of the pre-plant and in-season fertilizers at each sampling time were calculated as follows:

$$Crop\ residue\ N\ mineralization\ rate\ (\%) = \frac{((Npr - Np0) + (Nsr - Ns0))}{Ntr}\ X\ 100$$

$$Compost\ N\ mineralization\ rate\ (\%) = \frac{((Nprc - Npr) + (Nsrc - Nsr))}{Ntc}\ X\ 100$$

$$Pre\text{-}plant\ fert.N\ mineralization\ rate\ (\%) = \frac{((Nprcp - Nprc) + (Nsrcp - Nsrc))}{Ntp}\ X\ 100$$

$$In\text{-}season\ fert.N\ 1\ mineralization\ rate\ (\%) = \frac{((Nprcpi1 - Nprcp) + (Nsrcpi1 - Nsrcp))}{Nti1}\ X\ 100$$

$$In\text{-}season\ fert.N\ 2\ mineralization\ rate\ (\%) = \frac{((Nprcpi2 - Nprcpi1) + (Nsrcpi2 - Nprcpi1))}{Nti2}\ X\ 100$$

where Npr = plant biomass N (lb/acre) in Nr treatment, Np0 = plant biomass N (lb/acre) in N0 treatment, Nsr = soil inorganic N in 0'-3' depth (lb/acre) at Nr treatment, Ns0 = soil inorganic N in 0'-3' depth (lb/acre) at N0 treatment, Ntr = total residue biomass N applied in Nr treatment, Nprc = plant biomass N (lb/acre) in Nrc treatment, Nsrc = soil inorganic N in 0'-3' depth (lb/acre) at Nrc treatment, Nsrc = soil inorganic N in 0'-3' depth (lb/acre) at Nrc treatment, Ntc = total N applied by compost in Nrc treatment, Nprcp = plant biomass N (lb/acre) in Nrcp treatment, Nsrcp = soil inorganic N in 0'-3' depth (lb/acre) at Nrcp treatment, Ntp = total pre-plant N applied in Nrcp treatment, Nprcpi1 = plant biomass N (lb/acre) in Nrcpi1 treatment, Nsrcpi1 = soil inorganic N in 0'-3' depth (lb/acre) in Nrcpi1 treatment, and Nti1 = total N applied by in-season fertilizer at Nrcpi1 treatment, Nprcpi2 = plant biomass N (lb/acre) in Nrcpi2 treatment, Nsrcpi2 = soil

inorganic N in 0’-3’ depth (lb/acre) in Nrcpi2 treatment, and Nti2 = total N applied by in-season fertilizer at Nrcpi2 treatment. This method assumes that denitrification, N loss via surface runoff, and N leaching below 3' are negligible. It also assumes that the N rhizosphere priming effects across all treatments are similar, if any.

For Trial B, the grower grew organic baby lettuce and applied pre-plant fertilizer only for the crop. Thus, N mineralization of the pre-plant fertilizer was evaluated in a randomized complete block design with no organic fertilizer (N0) and preplant organic fertilizer (Nrcp) as treatments, with 4 replications. Each plot was 4 beds wide (26.7' wide) and 30' long, and the middle 2 beds were used for soil and plant sampling. N mineralization from organic fertilizers and SOM was determined by monitoring soil inorganic N at 0’-1', 1’-2', and 2’-3’ depths at pre-fertilization (baseline) plus at harvest in each plot. The N mineralization rate of SOM at harvest and the pre-plant fertilizer was calculated as described for Trial A.

Irrigation water samples were collected during the growth period, 2-3 times per trial, and analyzed for nitrate content. Irrigation amounts during the crop growth period were monitored to calculate nitrate-N input (lb-N/A) from irrigation water. Crop harvest evaluation was conducted by harvesting 20 heads (Trial A) or 10 rows x 1 m per bed x 2 beds (Trial B) from each plot. Dry biomass and biomass N in crop residues of the previous crop (head lettuce) were determined at harvest at Trial A. Soil and air temperature and soil moisture data were collected by sensors connected to dataloggers at both trials and was fed to the model (Geisseler et al., 2021) along with organic fertilizer and SOM parameters such as their total N content and C:N ratio to simulate N mineralization rates. The simulated data were compared against the estimated N mineralization rate over time.

Objective 4:

The N mineralization model developed under Objective 3 was integrated into the CM decision support tool. The addition of organic fertilizers and amendments to CM required updates to the database, an additional N mineralization algorithm specific to organic fertilizers and amendments, and changes to the user interface for the fertilizer list.

Objective 5:

Outreach to growers was conducted throughout the project period by presenting the project's outcomes at various in-person and online extension events.

F. Data/Results

Objective 1.

Task 1.1: Replicated N mineralization data of 172 organic fertilizers, composts, and manures, 64 cover crops and crop residues, and 12 soil organic matter were entered into the database. The mineralization data collected at 20-25 °C with near-field capacity moisture in different soils are summarized. See the attached database Excel spreadsheet for more details.

Task 1.2: About 42-55% and 58-72% of total N in SPHFs were mineralized in 1 week and 12 weeks, regardless of the form. The liquid fertilizer mineralized gradually, and the N mineralization rate reached 54% in 6 weeks and 60% in 12 weeks (Figure 1.1).

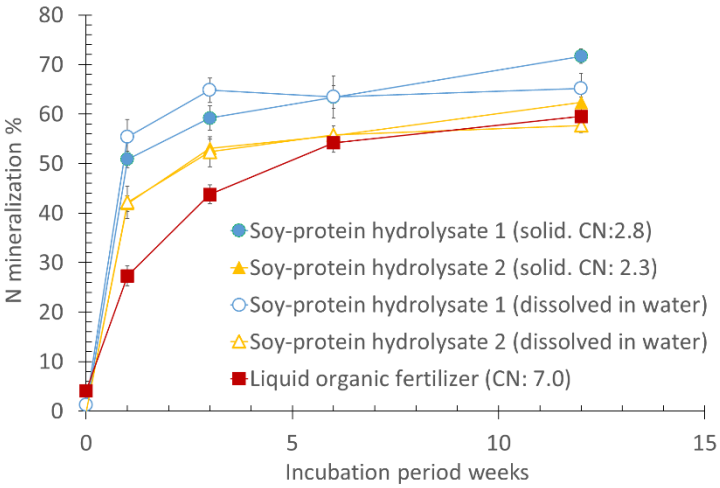
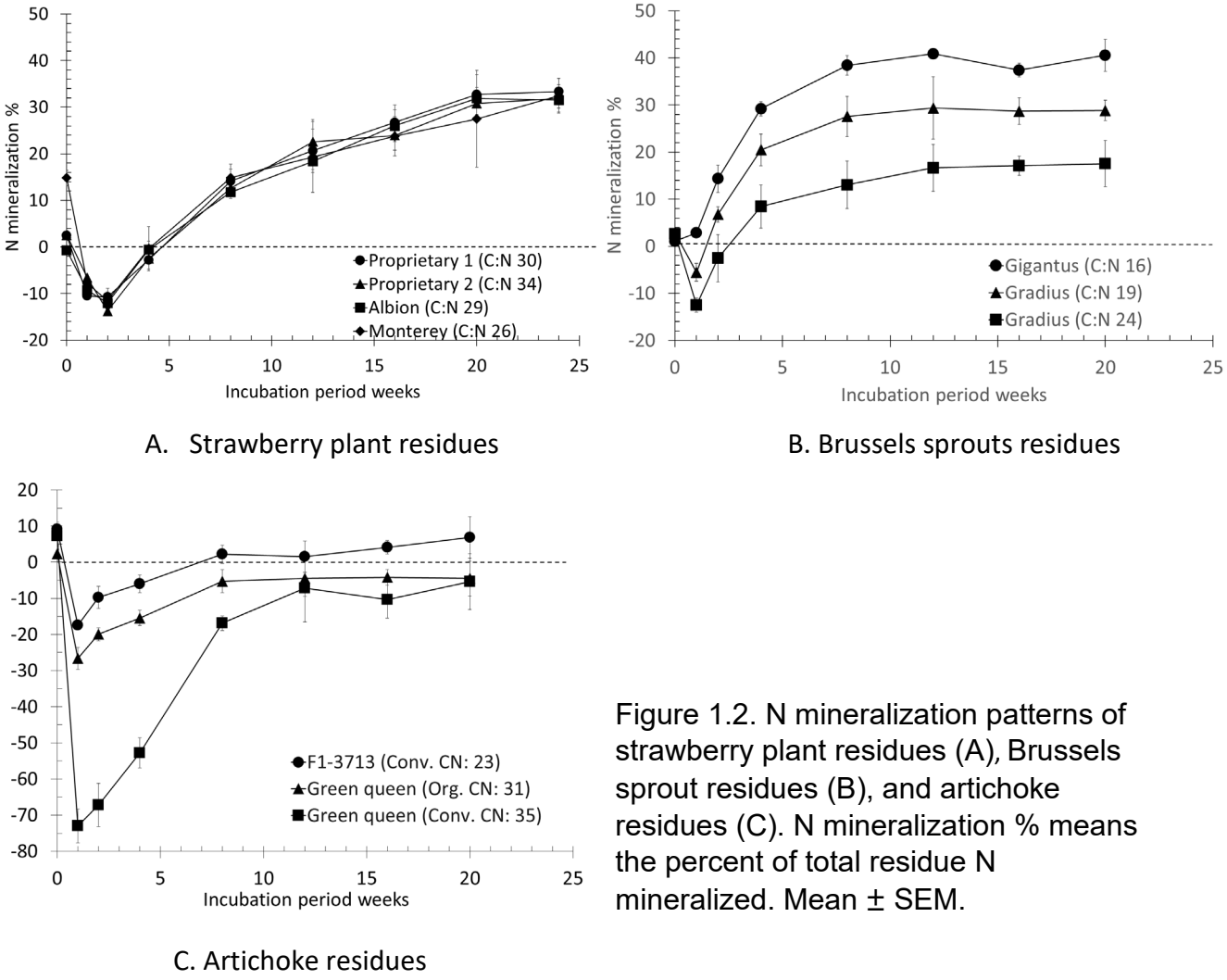


Figure 1.1. Nitrogen mineralization rate of soy-protein hydrolysate fertilizers and liquid organic fertilizer. N mineralization % means the percent of total residue N mineralized. Mean ± SEM.

Mineralization of 4 different strawberry variety residues showed a similar pattern, regardless of slightly different C:N ratios (26-34); they immobilized soil inorganic N for the first 4 weeks, then mineralized gradually, reaching 31-33% N mineralization rates at 24 weeks. After 24 weeks, it approached a plateau of about 30% (Figure 1.2A). For Brussels sprout residues, three residues showed completely different N mineralization patterns depending on their C:N ratio; A Gigantus variety residues with CN: 15.9 mineralized fastest and reached to 41% at 12 weeks, followed by a Gradius variety residues with CN: 18.9 (29% at weeks 12), and a Gradius variety with CN: 24.4 had the lowest mineralization rate of 17% at weeks 12 (Figure 1.2B).

Three artichoke residues sampled had different biomass and C:N ratios (Table 1.3). All three residues immobilized inorganic N in the soil (= negative N mineralization) for the first 4 weeks to varying degrees, depending on their C:N ratios (Fig. 1.2C). The lowest N mineralization rate was -73%, -27%, and -17% for Residue 1 (C:N 35), 2 (C:N 31), and 3 (C:N 23), respectively, all at week 1. After 20 weeks, Residue 3, the lowest C:N ratio among the three samples, was the only one that had positive net N mineralization of 6.9%, and the other two residues had negative net N mineralization of - 4.5% (Fig. 1.2C). Strawberry plant residues had C:N ratios similar to those of artichoke residues



A. Strawberry plant residues

B. Brussels sprouts residues

C. Artichoke residues

Figure 1.2. N mineralization patterns of strawberry plant residues (A), Brussels sprout residues (B), and artichoke residues (C). N mineralization % means the percent of total residue N mineralized. Mean ± SEM.

(Table 1.1). Yet, they showed significantly different N mineralization patterns (Figure 1.2A and 1.2C), probably due to differences in their carbon compound composition (i.e., lignin, cellulose, and non-structural carbohydrates).

Objective 2.

Task 2.1: A simple N turnover model adapted from CERES Maize was used to simulate N mineralization and immobilization from soil organic matter and added organic materials. A total of 113 datasets were included in the study. The model

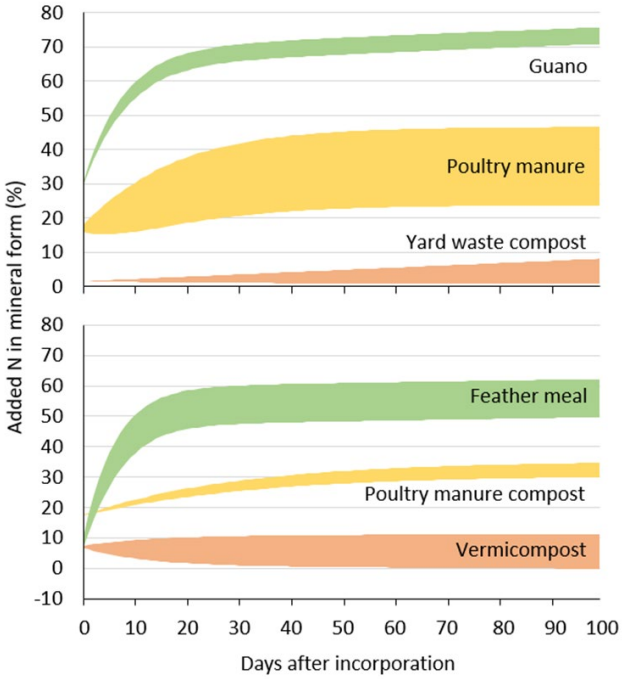


Figure 2.1. Availability of N from organic fertilizers and composts. The graph shows modeled values based on literature data on amendments incorporated into soil at 25 °C and optimal soil moisture. The range reflects N availability of the materials with the highest and lowest C:N ratio in the dataset.

predicted that 61% of total N in feather meal with an average CN ratio of 4 would be in the mineral form after 100 days under optimal conditions (Figure 2.1). Guano is a similarly readily available N source, with 72.5% of the total N being in the mineral form after 100 days. Nitrogen availability from poultry manure and poultry manure compost was lower. On average, 16-17% of total N was present as mineral N in the materials, while at the end of the 100-day simulation, 39.6% and 32.7% of total N from an average poultry manure and its compost, respectively, were in the mineral form. Poultry manure is a heterogeneous fertilizer, and literature values vary considerably (Figure 2.1). Yard waste compost and vermicompost are stable materials, with less than 10% of the total N in an average material being in the mineral form at the end of the 100-day simulation. The results of this study allow the estimation of N release from a variety of organic fertilizers and composts. The results were summarized in a scientific article and published in the Journal of Environmental Quality (Geisseler et al., 2021). The model was also adopted for the online calculation tool posted on the Geissler Lab website in English and Spanish.

Objective 3.

Task 3.1: Trial 1's treatments included soil-only (A), A + crop residues (B), B + compost (C), C + pre-plant fertilizer (D), D + in-season fertilizer 1 (E), E + in-season fertilizer 2 (F), with 4 replications (Table 3.1).

Soil organic N mineralized 1.4%, releasing 210 lb-N/ac of inorganic N from the top 3' soil profile during the broccoli growth period (Table 3.1). The mineralization rate ranged

Table 3.1. N sources evaluated in the broccoli field trial (Trial 1).

Treatment	N source	Total N (lb-N/acre)	C/N	Date applied or sampled
Soil (A)	Residual soil inorganic N and soil organic matter in 0-3ft depth	15,217	11.7	5/9/22
A + Crop residue (B)	Iceberg lettuce (pre-crop) residues	66.4	15.2	5/19/22
B + Compost: Lime (3:1 mix) (C)	Compost 0.75: 0.65: 0.5	67.1	14.2	5/23/22
C + Pre-plant fertilizer (D)	Meat and bone meal 8-6-5	64.3	4.9	5/24/22
D + In-season fertilizer 1 (E)	Blood meal, poultry manure, feather meal 10.5:0.5:0.5	99.4	4.1	6/20/22
E + In-season fertilizer 2 (F)	Seabird guano 12-12-2.5	58.0	1.1	7/12/22

Table 3.2. Calculated mineralized N rate (%) and amount (lb-N/ac) from different sources in the broccoli trial (Trial 1). Mineralized N means the percent of total applied N mineralized.

N source	Mineralized N %			Mineralized N lb-N/ac		
	6/23/22	7/14/22	8/16/22	6/23/22	7/14/22	8/16/22
Soil organic N 0'-3' depth	0.4 (0.2) *	0.1 (0.1)	1.4 (0.1)	50 (20)	21 (21)	210 (24)
Lettuce residue	-40 (20)	68 (25)	76 (36)	-27 (14)	44 (17)	53 (25)
Compost	20 (20)	-59 (15)	-56 (55)	12 (13)	-37 (6.8)	-44 (34)
Pre-plant fertilizer	29 (37)	35 (7.2)	58 (55)	19 (23)	23 (4.7)	37 (35)
In-season fertilizer 1	3.6(25)	53 (18)	38 (19)	3.1 (25)	53 (19)	37 (18)
In-season fertilizer 2	-	-	58 (17)	-	-	34 (10)

* ( ): SEM

from -56 (compost) to 76 % (lettuce residues), but the variability (SEMs) of each N source was extremely high, due largely to the highly variable soil inorganic N content.

In Trial 2, N mineralization from soil organic N and a pre-plant organic fertilizer was evaluated (Table 3.3). During the mixed baby lettuce growth period (~1 month), soil organic N mineralized at only 0.1% (Table 3.4). Although approximately 24% of the total N in the organic fertilizer was mineralized, the mean mineralization rate was highly variable (Table 3.4), again due to highly variable inorganic N contents in the soil profile.

Table 3.3. N sources evaluated in the broccoli field trial (Trial 2).

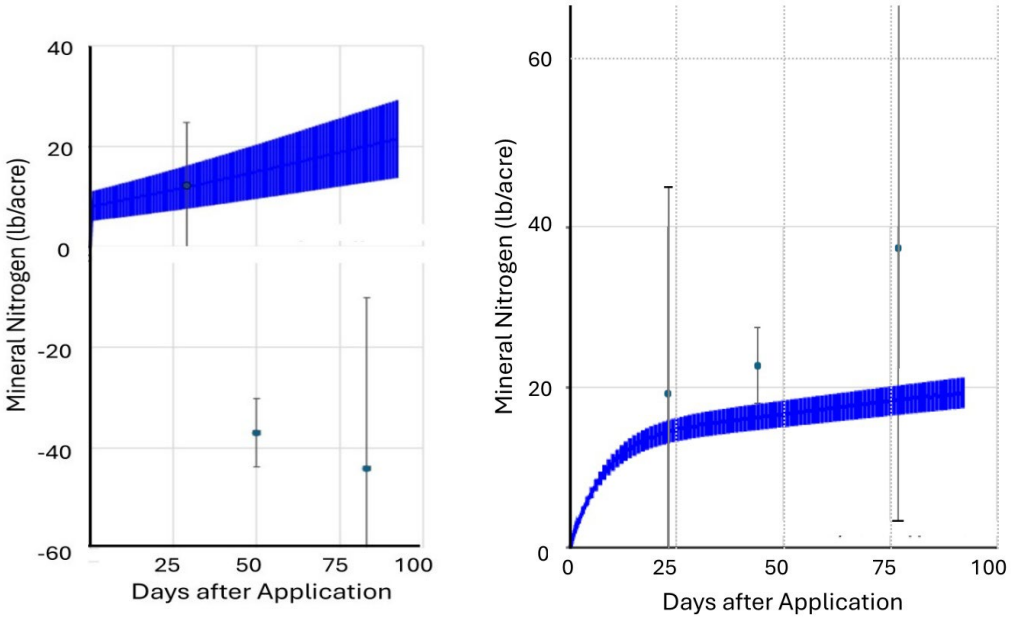
Treatment	N source	Total N (lb-N/acre)	C/N	Date applied or sampled
Soil (N0)	Residual soil inorganic N and soil organic matter in 0-3ft depth	10,572	7.2	8/02/22
Soil + Pre-plant fertilizer (Nf)	Pelleted 6-6-2 Poultry Manure, Seabird Guano, and Meat & Bone Meal	90	5.1	8/03/22

Table 3.4. Calculated mineralized N rate (%) and amount (lb-N/ac) of soil organic N and organic fertilizer in the mixed baby lettuce trial on 9/5/2022 (Trial 2). Mineralized N means the percent of total applied N mineralized.

N source	Mineralized N %	Mineralized N lb-N/ac
Soil organic N 0'-3' depth	-0.1 (0.17) *	-7.9 (17)
Pre-plant fertilizer	24 (59)	21 (52)

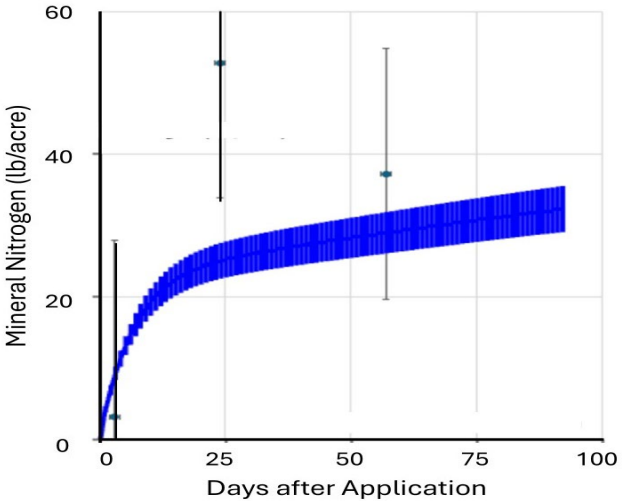
* ( ): SEM

These field-scale mineralized N data of compost, pre-plant fertilizer, in-season fertilizer-1, and in-season fertilizer-2 in Trial 1, and pre-plant fertilizer in Trial 2 (Tables 3.2 and 3.4) were graphically compared with simulated data generated by the online model using actual data of organic fertilizers (application rate and date, C:N ratio, dry matter, mineral N content), and application date under the Central Coast climate conditions with incorporation depth of 6" (Figure 3.1). In the online model, "Yard Waste Compost" was selected for simulating the N mineralization from compost, "Pelleted Material" for pre-plant fertilizers in Trials 1 and 2, and in-season fertilizer-1 in Trial 1, and "Guano" for in-season fertilizer-2 in Trial 1.

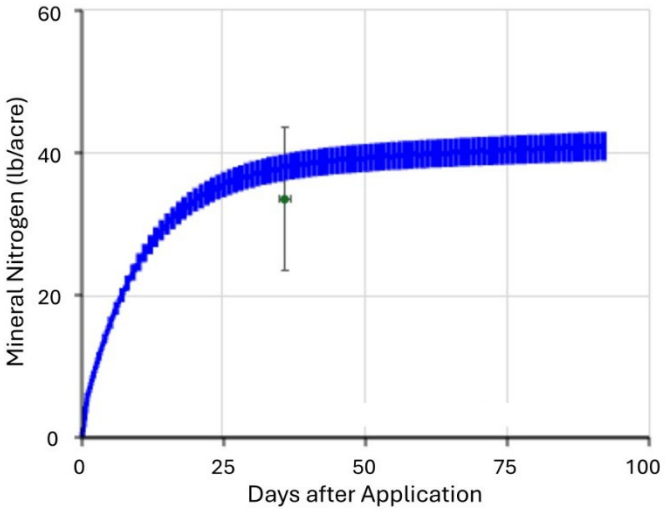


A. Compost (Trial 1) B. Pre-plant fertilizer (Trial 1)

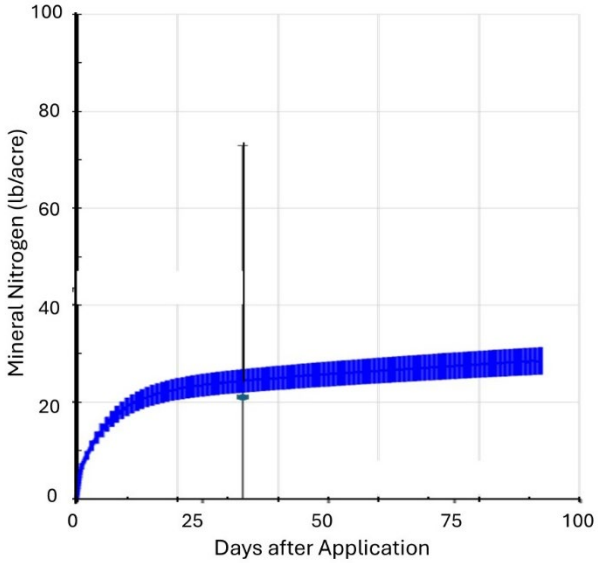
Figure 3.1. Graphical comparison of the simulated mineralized N data and the field-measured mineralized N data for the compost in Trial 1 (A), and the pre-plant fertilizer in Trial 1 (B). A blue range in each figure shows the simulated data. Field data are shown as a mean (dot) ± SEM (error bar). Some error bars exceed the graphed area.



C. In-season fertilizer-1 (Trial 1)



D. In-season fertilizer-2 (Trial 1)



E. Pre-plant fertilizer-1 (Trial 2)

Figure 3.1 (cont.). Graphical comparison of the simulated mineralized N data and the field-measured mineralized N data for the in-season fertilizer-1 in Trial 1 (C), the in-season fertilizer-2 in Trial 1 (D), and the pre-plant fertilizer in Trial 2 (E). A blue range in each figure shows the simulated mineralized N data. Field data are shown as a mean (dot) ± SEM (error bar). Some error bars exceed the graphed area.

Results showed that the simulated compost mineralized N data differed greatly from the measured data, which showed N immobilization after 50 days after application (Figure 3.1A). For pre-plant and in-season fertilizers, all simulated mineralized N data overlapped with the mean ± SEM range of each measured data point (Figures 3.1B, C, D, and E), except for one point in the in-season fertilizer-1 in Trial 1 (Figure 3.1C).

G. Discussion and Conclusions

Our literature survey highlights the variability in N availability across and within groups of organic fertilizers and composts. The variability observed within certain groups of organic amendments indicates where further research can help to improve N mineralization models. However, the information available for individual batches of commercial amendments is generally limited, making net N mineralization (and immobilization) predictions based on the C:N ratio often the best option available.

The datasets our model is based on consisted of laboratory incubations conducted at optimal moisture content and a constant temperature. While conditions in the field can vary considerably, studies have found good correlation between N mineralization in laboratory incubations and N mineralization or crop N uptake in the field with the same soil type (Castellanos & Pratt, 1981; Gale et al., 2006; Haney et al., 2001). Therefore, with appropriate temperature and soil moisture corrections, the model can help estimate the amount and timing of N availability for typical field amendments.

Our field trial data demonstrated that our N mineralization model can make reasonable estimates of N mineralization from pre-plant and in-season organic fertilizers, though the field data were highly variable (Figures 3.1B, C, D, E). The discrepancy between modeled and field-measured mineralized N in compost in Trial 1 (Figure 3.1A) may be attributed to the quality of the carbon compounds in the compost applied. Currently, the types of organic fertilizers that can be estimated in the model are limited to 8. More research is needed to expand the selections and improve the accuracy.

The present project also confirmed significant variation in the relationships between N mineralization rates and C:N ratios among organic fertilizers and crop residues. For organic fertilizers, we found that SPHFs' N mineralization rates were lower than expected from the known relationships between N mineralization rates and C:N ratios reported in a previous study (Lazicki et al., 2020). For crop residues, in our lab incubation study of N mineralization patterns in strawberry, Brussels sprout, and artichoke residues, aimed at replicating field-condition N mineralization but not exactly the same, we found that the relationships between N mineralization rates and C:N ratios differ among residue types. Recently, Geisseler et al. (2025) showed that a specifically calibrated three-pool model was needed to accurately estimate N mineralization from cereal cover crops based on their C:N ratios. Again, N mineralization predictions based on the C:N ratio are often the best option available. However, we need further research on the relationships between N mineralization and C:N ratios across many other crop residues, cover crops, and organic fertilizers, as they may differ in the composition of carbon compounds, such as lignin, cellulose, and non-structural carbohydrates, which can affect these relationships.

H. Challenges

COVID-related lab access restrictions and resulting labor shortages slowed progress on the lab incubation and field trials in the first two years of this project. However, we managed to catch up thanks to the awarded no-cost extensions. Conducting a successful on-farm field trial requires close, constant contact with the hosting growers. During one field trial, a grower accidentally applied pre-plant fertilizer to all plots, jeopardizing the entire trial. He apologized and re-committed to conducting another trial in the following year, which went well.

I. Project Impacts

This project developed an online N-mineralization simulation tool for 8 organic fertilizers, freely available to the public in English and Spanish. We introduced it through our workshops and seminars (see below), and the tool has been widely used. Between April 2023 and the end of 2025, 1288 active users accessed the online calculator across 2178 sessions. We expect that integrating the model into CropManage (the demo version is available at dev.cropmanage.ucanr.edu) will further improve the N management for organic growers in California, especially when combined with soil and plant tissue testing.

The outcomes of this project have also provided additional scientific basis for introducing discount factors for organic fertilizers into the calculation of N budgets on farms in the AgOrder 4.0 by the California State Water Resources Control Board.

J. Outreach Activities Summary

During the five-year project period, we presented a part of the project outcomes at 24 events, reaching approximately 1,200 people in California and beyond. See Appendix 1 and 2 for more information.

K. References

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L. Appendix

App.1. Outreach activity list

Event Name (1)	The Annual Salinas Valley Irrigation and Nutrient Management Meeting		
Presentation title	Nitrogen mineralization from organic fertilizers and composts		
Location and date	Virtual meeting, 2/23/2021		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.		
CCA/Grower Continuing Education Units (CEUs) offered	3.0 CCA & 1.0 CDPR continuing education credits	**Number of participants**	Approximately 150

Event Name (2)	Practical Training on Nitrogen Management in Organic Production of Vegetables and Strawberries (Online three-part workshop)
Presentation title	Nitrogen in the soil: Nitrogen mineralization from soil organic matter
Location and date	Virtual. 3/2/2021
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.
CCA/Grower Continuing Education Units (CEUs) offered	6 hours of CCA credits

Event Name (3)	29TH FREP/WPHA Annual Conference		
Presentation title	Developing a nitrogen mineralization model for organically managed vegetable farms on the Central Coast (reported in the proceedings)		
Location and date	CalPoly, SLO, 10/27-28/2021		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.		
CCA/Grower Continuing Education Units (CEUs) offered	CCA CEUs: 4.0 SWM, 3.0 NM, 0.5 CM CDFA INMP Credits: 6.5 hours	**Number of participants**	~50

Event Name (4)	UC ANR Vegetable Crops Program Team Meeting		
Presentation title	An online tool to estimate nitrogen mineralization from organic amendments		
Location and date	Virtual via Zoom, December 13, 2021		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	UCCE Farm Advisors and Specialists		
CCA/Grower Continuing Education Units (CEUs) offered	none	**Number of participants**	~30

Event Name (5)	The Annual Salinas Valley Irrigation and Nutrient Management Meeting		
Presentation title	Nitrogen Mineralization from Organic Fertilizers and Composts		
Location and date	Virtual meeting, 2/23/2022		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.		
CCA/Grower Continuing Education Units (CEUs) offered	3.0 CCA & 1.0 CDPR continuing education credits	**Number of participants**	Approximately 150

Event Name (6)	FREP/WPH Nutrient Management Conference		
Presentation title	Developing a nitrogen mineralization model for organically managed vegetable farms on the Central Coast		
Location and date	Visalia, 10/26/2022		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.		
CCA/Grower Continuing Education Units (CEUs) offered	unknown	**Number of participants**	Approximately 150

Event Name (7)	Practical Training on Nitrogen Planning and Management in Organic Production of Annual Crops		
Presentation title	Presentation 1: Nitrogen mineralization from soil organic matter Presentation 2: Estimating nitrogen release from organic amendments		
Location and date	Virtual meeting, 11/29/2022, 12/05/22, 12/12/2022		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.		
CCA/Grower Continuing Education Units (CEUs) offered	6.0 hours CCA credits & 6.0 hours of CDPR-INMTP CE credits	**Number of participants**	91

Event Name (8)	Organic Agriculture Workshop		
Presentation title	Organic Agriculture in California and Nitrogen Management in Organic Systems		
Location and date	Escondido, 12/8/2022		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.		
CCA/Grower Continuing Education Units (CEUs) offered	6.5 CCA hours & 0.5 "Laws and Regs" and 4 "Others" DPR credits hours offered	**Number of participants**	44

Event Name (9)	Carmel Valley Garden Club		
Presentation title	Organic Agriculture in California and Soil Health Management in Organic Systems		
Location and date	Carmel Valley, 1/12/2023		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	Gardeners		
CCA/Grower Continuing Education Units (CEUs) offered	None	**Number of participants**	Approximately 30

Event Name (10)	California Organic Products Advisory Committee (COPAC) meeting		
Presentation title	Developing a nitrogen mineralization model for organically managed vegetable farms on the Central Coast		
Location and date	Asilomar, 1/19/2023		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	COPAC Board members, CDFA State Organic Program staff, growers, researchers, and NGO reps		
CCA/Grower Continuing Education Units (CEUs) offered	None	**Number of participants**	Approximately 30

Event Name (11)	Organic Agriculture Seminar Series for Growers		
Presentation title	Nitrogen Mineralization from Organic Fertilizers and Composts		
Location and date	Online, 1/24/2023		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.		
CCA/Grower Continuing Education Units (CEUs) offered	Unknown	**Number of participants**	Approximately 50

Event Name (12)	Conservation Innovation Grant Project Meeting		
Presentation title	Nitrogen Mineralization from Organic Fertilizers and Composts		
Location and date	Online, 2/24/2023		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	Organic growers, and researchers		
CCA/Grower Continuing Education Units (CEUs) offered	None	**Number of participants**	Approximately 10

Event Name (13)	Wester Nutrient Management Conference		
Presentation title	Nitrogen availability from organic amendments		
Location and date	Reno, NV, 3/09/2023		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.		
CCA/Grower Continuing Education Units (CEUs) offered	7.5 CEU	**Number of participants**	Approximately 100

Event Name (14)	UCCE Vegetable & Organic Production Workshop		
Presentation title	Organic Agriculture in California and Nitrogen Management in Organic Systems		
Location and date	El Centro, CA, 4/14/2023		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.		
CCA/Grower Continuing Education Units (CEUs) offered	Unknown	**Number of participants**	Approximately 20

Event Name (15)	CAPCA Ventura Seminar		
Presentation title	Nitrogen and Soilborne Disease Management in Organic Systems		
Location and date	Santa Paula, CA, 9/20/2023		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs		
CCA/Grower Continuing Education Units (CEUs) offered	Yes, but details unknown	**Number of participants**	71

Event Name (16)	Practical Training in Nitrogen Planning and Management in Organic Production of Annual Crops		
Presentation title	Presentation 1: Nitrogen mineralization from soil organic matter Presentation 2: Estimating nitrogen release from organic amendments		
Location and date	Virtual meeting, 11/28/2023, 12/05/23, 12/12/2023		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.		
CCA/Grower Continuing Education Units (CEUs) offered	6.0 hours CCA credits & 6.0 hours of CDPR-INMTP CE credits	**Number of participants**	Approximately 50

Event Name (17)	UCCE Organic Crop Day, Mendocino County		
Presentation title	Nitrogen Management in Organic Systems		
Location and date	Hopland, CA. 4/24/2024		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	Growers, researchers, NGO reps, PCAs		
CCA/Grower Continuing Education Units (CEUs) offered	CCA (2.5 hrs), DPR (1.5 hrs)	**Number of participants**	15

Event Name (18)	UCCE Organic Farming Workshop, Lake County		
Presentation title	Nitrogen Management in Organic Systems		
Location and date	Lakeport, CA. 4/25/2024		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	Growers, industry reps		
CCA/Grower Continuing Education Units (CEUs) offered	N/A	**Number of participants**	13

Event Name (19)	UCCE Organic Crops Day, Sonoma County		
Presentation title	Nitrogen Management in Organic Systems		
Location and date	Santa Rosa, CA 4/26/2024		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	Growers, researchers, students, Ag industry reps, policymakers		
CCA/Grower Continuing Education Units (CEUs) offered	CCA (2.5 hrs), DPR (1.5 hrs), INMP (0.5 hrs)	**Number of participants**	~20

Event Name (20)	Santa Clara Master Gardener seminar		
Presentation title	Nitrogen Management in Organic Production		
Location and date	San Jose, CA, 6/20/24		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	Master gardeners in Santa Clara County		
CCA/Grower Continuing Education Units (CEUs) offered	None	**Number of participants**	Approximately 30

Event Name (21)	Practical Training in Nitrogen Planning and Management in Organic Production of Annual Crops		
Presentation title	Presentation 1: Nitrogen mineralization from soil organic matter Presentation 2: Estimating nitrogen release from organic amendments		
Location and date	Virtual meeting, 11/18/2024, 11/25/24, 12/02/2024, 12/09/24		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.		
CCA/Grower Continuing Education Units (CEUs) offered	6.0 hours CCA credits & 6.0 hours of CDPR-INMTP CE credits	**Number of participants**	52

Event Name (22)	Santa Clara Master Gardener Seminar		
Presentation title	Soil and fertilizer		
Location and date	Online, 1/30/2025		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	UCCE Master Gardeners in Santa Clara County		
CCA/Grower Continuing Education Units (CEUs) offered	None	**Number of participants**	Approximately 30

Event Name (23)	Siskiyou Organic Workshop		
Presentation title	Soil Health and Nitrogen Management in Organic Production		
Location and date	San Jose, CA, 6/20/24		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	Organic growers in Siskiyou County		
CCA/Grower Continuing Education Units (CEUs) offered	None	**Number of participants**	17

Event Name (24)	Practical Training in Nitrogen Planning and Management in Organic Production of Annual Crops		
Presentation title	Presentation 1: Nitrogen mineralization from soil organic matter Presentation 2: Estimating nitrogen release from organic amendments		
Location and date	Woodland, CA, 12/08/2025		
Attendee demographics (CCAs, PCAs, growers, consultants, researchers, etc.)	CCAs, PCAs, growers, consultants, researchers, and NGO reps.		
CCA/Grower Continuing Education Units (CEUs) offered	6.0 hours CCA credits & 6.0 hours of CDPR-INMTP CE credits	**Number of participants**	Approximately 30

App.2. Documentation of the Outreach events

SALINAS VALLEY AGRICULTURE

Highlighting agricultural developments, problems, research, & issues for central coast CA

2021 Irrigation and Nutrient Management (Virtual) Meeting

Author: **Michael Cahn**
Author: **Richard Smith**

Published on: January 22, 2021

Tuesday, February 23;

7:55 a.m. to 12:00 p.m.

Habrá traducción al Español

Registration Cost: $10

Registration Link: https://ucanr.edu/survey/survey.cfm?surveynumber=32769

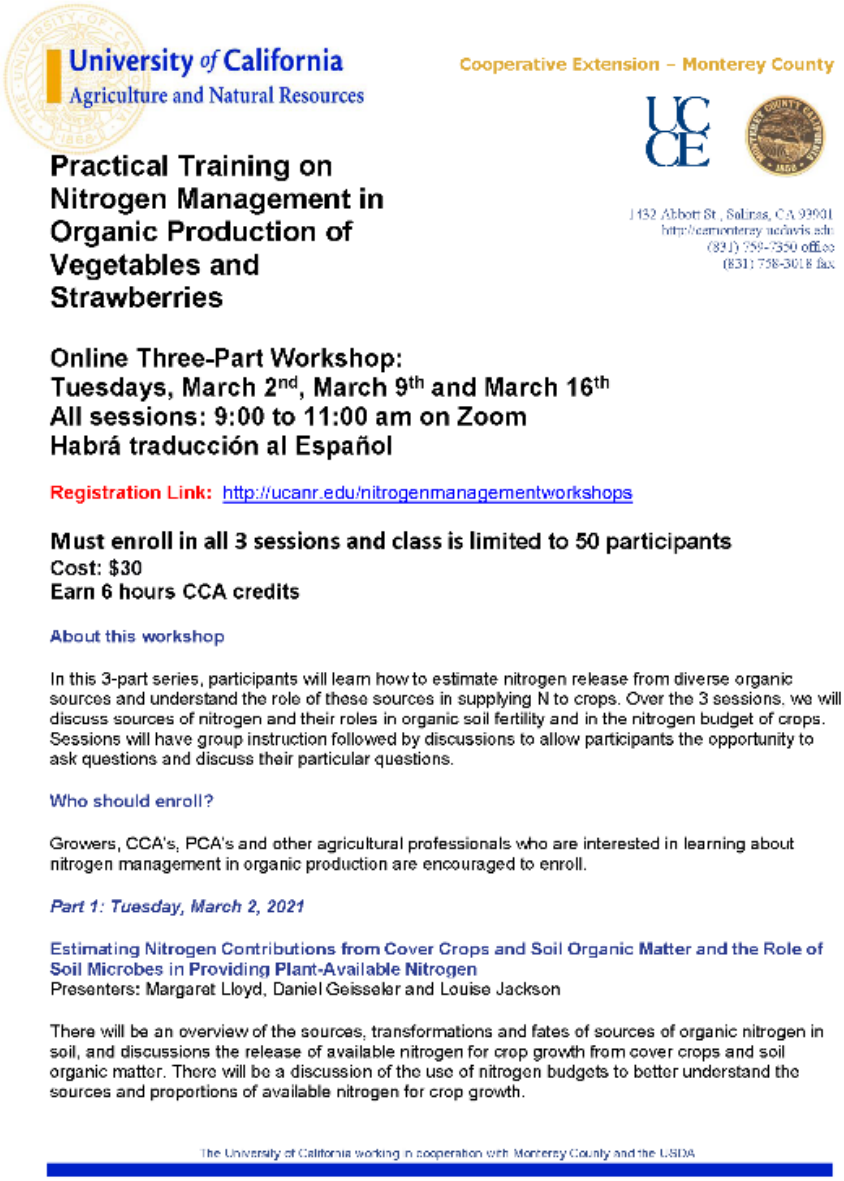
7:55	**Introduction**
8:00	Woodchip bioreactors for removal of nitrate and pesticides from tile drainage.
	Pam Krone-Davis, California Marine Sanctuary Foundation
8:30	Nitrogen mineralization from organic fertilizers and composts
	Daniel Geisseler, UC Davis
9:00	Improving the efficiency of drip germination of lettuce and weed control.
	Michael Cahn and Richard Smith, UC Cooperative Extension
9:30	Using weather-based irrigation scheduling for optimizing red cabbage production.
	Lee Johnson, NASA Ames Research Center-CSUMB
10:00	**Break**
10:15	Update on Ag Order 4.0.
	Matt Keeling, Central Coast Regional Water Quality Control Board
10:45	Development of N removal coefficients for vegetables on the central coast
	Richard Smith, UC Cooperative Extension
11:15	New approaches for using Polyacrylamide (PAM) for mitigating sediment and pesticides in irrigation runoff.
	Michael Cahn, UC Cooperative extension
11:45	Using high-carbon compost for reducing nitrate leaching during the winter.
	Richard Smith, UC Cooperative Extension
12:00	**Adjourn**

CCA & DPR continuing education credits have been requested

Focus Area Tags: Agriculture, Environment
Tags: Irrigation and nutrient management workshop (1), Irrigation management (2), Nutrient management (5), Workshop (4)
Comments: 0

No Comments Posted.

App. 2.1: 2021 Irrigation and Nutrient Management Meeting Program



University of California
Agriculture and Natural Resources

Cooperative Extension – Monterey County

1432 Abbott St., Salinas, CA 93901
http://cemonterey.ucdavis.edu
(831) 759-7350 office
(831) 758-3018 fax

Practical Training on Nitrogen Management in Organic Production of Vegetables and Strawberries

Online Three-Part Workshop:
Tuesdays, March 2nd, March 9th and March 16th
All sessions: 9:00 to 11:00 am on Zoom
Habrá traducción al Español

Registration Link: http://ucanr.edu/nitrogenmanagementworkshops

Must enroll in all 3 sessions and class is limited to 50 participants
Cost: $30
Earn 6 hours CCA credits

About this workshop

In this 3-part series, participants will learn how to estimate nitrogen release from diverse organic sources and understand the role of these sources in supplying N to crops. Over the 3 sessions, we will discuss sources of nitrogen and their roles in organic soil fertility and in the nitrogen budget of crops. Sessions will have group instruction followed by discussions to allow participants the opportunity to ask questions and discuss their particular questions.

Who should enroll?

Growers, CCA's, PCA's and other agricultural professionals who are interested in learning about nitrogen management in organic production are encouraged to enroll.

Part 1: Tuesday, March 2, 2021

Estimating Nitrogen Contributions from Cover Crops and Soil Organic Matter and the Role of Soil Microbes in Providing Plant-Available Nitrogen
Presenters: Margaret Lloyd, Daniel Geisseler and Louise Jackson

There will be an overview of the sources, transformations and fates of sources of organic nitrogen in soil, and discussions the release of available nitrogen for crop growth from cover crops and soil organic matter. There will be a discussion of the use of nitrogen budgets to better understand the sources and proportions of available nitrogen for crop growth.

The University of California working in cooperation with Monterey County and the USDA

App. 2.2: Practical Training on Nitrogen Management in Organic Production of Vegetables and Strawberries Program (page 1)

Part 2: Tuesday, March 9, 2021

Estimating Nitrogen Release from Organic Amendments and Irrigation Water
Presenters: Patricia Lazicki, Margaret Lloyd and Michael Cahn

This session will focus on estimating nitrogen release from compost and estimates of nitrogen release from different organic amendments and organic nitrogen fertilizers. There will be a discussion of how much nitrogen is available from irrigation water of different nitrate contents.

Part 3: Tuesday, March 16, 2021

Putting it all Together: Nitrogen Management in Strawberries and Vegetables and Discussion of New Concepts in Organic Nitrogen Nutrition
Presenters: Joji Muramoto and Richard Smith

In this session, we will address specific aspects of organic soil fertility management in strawberries and cool season vegetables. Discussions will include crop nitrogen demand and strategies to supply demand. Specific references will be made to strategies for complying with forthcoming regulations being developed by the Central Coast Regional Water Quality Control Board. We will conclude with a discussion on new frontiers in organic nitrogen management.

About the Presenters

	Daniel Geisseler is an associate Cooperative Extension specialist in the Department of Land, Air and Water Resources at UC Davis. Daniel's research and outreach focuses on nutrient turnover and plant nutrition in agricultural systems. He is interested in the effects that different management practices have on nutrient use in California crops and how nutrient use efficiency can be improved, particularly with nitrogen.
	Patricia Lazicki is a Ph.D. candidate in Soil Science at UC Davis. Previously, as a soil science researcher, she worked to develop the nitrogen guidelines for crops throughout California. Her research continues to focus on soil health and fertility in organic cropping systems.
	Margaret Lloyd is the Small Farms Advisor for Yolo, Solano and Sacramento Counties. Her research and outreach focus is on the needs of organic vegetable farms. She has spent several years working to develop nitrogen guidelines for organic fresh market tomato production while working on other aspects of nitrogen management for organic growers.

App. 2.2: Practical Training on Nitrogen Management in Organic Production of Vegetables and Strawberries Program (page 2)

	Joji Muramoto is an assistant Cooperative Extension organic production specialist based at UC Santa Cruz. His research and extension focus on fertility and soilborne disease management in organic vegetables and strawberries. With his statewide responsibility for research and extension in organic production, he is networking organic systems researchers across the state to better serve organic communities throughout California.
	Richard Smith is Vegetable Crops and Weed Science Farm Advisor in Monterey, Santa Cruz and San Benito Counties with the University of California Cooperative Extension. Richard conducts a research and education program on nutrient management in cool season vegetables to help growers improve efficiency of applied nitrogen. He is interested in practices and tools that help growers obtain economic yields while reducing the risk of nitrate leaching.
	Louise Jackson is an emeritus Professor and Cooperative Extension Specialist from the Department of Land, Air and Water Resources at UC Davis. She worked for many years researching nitrogen cycling and how soil microbes affect nitrogen availability to plants. Her research covered both cool and warm season vegetable farming systems in the Salinas and Sacramento Valleys.
	Michael Cahn is the Irrigation and Water Resources Farm Advisor in Monterey, Santa Cruz and San Benito Counties with the University of California Cooperative Extension. Michael has conducted extensive research on improving nitrogen use efficiency through precise irrigation management. He developed the on-line irrigation and nutrient management decision program, CropManage.




For more information, contact Richard Smith @ 831-759-7357, email: rifsmith@ucdavis.edu

App. 2.2: Practical Training on Nitrogen Management in Organic Production of Vegetables and Strawberries Program (page 3)

Vegetable Crops Program Team Meeting 2021

December 13 and 14, 2021 • 1:00-4:00 PM (California time) each day • via Zoom

DAY 1 • Monday, December 13, 2021 • 1:00-4:00 PM (CA time)

12:45-1:00 PM	Log in time
1:00-1:35 PM	Welcome, introductions (Moderator: Steve Fennimore)
1:03-1:10	**Hung Doan** • UCCE Small Farms Advisor, Riverside and San Bernardino Counties
1:10-1:17	**Vong Moua** • UCCE Small Farms Community Educator, San Joaquin, Stanislaus and Merced Counties
1:17-1:24	**Apurba Barman** • UCCE Area IPM Advisor (Imperial, San Diego and Riverside Counties)
1:24-1:31	**Robert Masson** • Yuma County Cooperative Extension Assistant Agricultural Extension Agent
1:35-4:15 PM	SECTION 1: **Irrigation, water quality and soil management** (Moderators: Mike Cahn, Andre Biscaro, Ali Montazar)
1:35-1:55	An online tool to estimate nitrogen mineralization from organic amendments • *Daniel Geisseler, CE Nutrient Management Specialist, Dept. of Land, Air and Water Resources, UC Davis*
1:55-2:15	CDFA HSP and SWEEP funding opportunities: A regional partnership providing technical assistance for grant application and project implementation to growers on the Central Coast' • *Aparna Gazula, UCCE Small Farm Advisor, Santa Clara, San Benito and Santa Cruz Counties*
2:15-2:35	Research advances in adopting drip irrigation for spinach production • *Ali Montazor, UCCE Irrigation and Water Management Advisor, Imperial, Riverside and San Diego Counties*
2:35-2:45	*Break*
2:45-3:05	New approaches for using polyacrylamide to mitigate suspended sediments and pesticides in irrigation runoff • *Mike Cahn, UCCE Irrigation and Water Resources Farm Advisor, Monterey, Santa Cruz and San Benito Counties*
3:05-3:25	Water requirements of celery for optimizing yield and quality • *Andre Biscaro, UCCE Irrigation and Water Resources Advisor, Ventura, Los Angeles and San Bernardino Counties*
3:25-3:55	N removal coefficients for complying with Ag Order 4.0 water quality regulations on central coast • *Richard Smith, UCCE Vegetable Crop Production and Weed Science Farm Advisor, Monterey, Santa Cruz and San Benito Counties*
3:55-4:15	First year experiences and lessons gained from adapting the 'CropManage' irrigation decision-support tool in watermelon • *Zheng Wang, UCCE Vegetable Crop Advisor, Stanislaus County*
4:15 PM	Adjourn for day

App. 2.3: Vegetable Crops Program Team Meeting 2021 Program

SALINAS VALLEY AGRICULTURE
Highlighting agricultural developments, problems, research, & issues for central coast CA

2022 Irrigation and Nutrient Management Meeting

Author: Richard Smith

Published on: February 7, 2022

2022 Irrigation and Nutrient Management Meeting

Wednesday, February 23, 2022

Register to join us for this webinar: https://surveys.ucanr.edu/survey.cfm?surveynumber=36536
Virtual Meeting registration cost: $10

Zoom Log-in info will be sent closer to the event date
For more info, contact: anrprogramsupport@ucanr.edu, 530-750-1361 (messages only)

Continuing Education Units

California DPR: 1 unit *(applied for)*
CCA: Nutrient Management (1), Soil & Water Management (2.5)

Schedule

7:55 **Introduction**

8:00 **Nitrogen Mineralization From Organic Fertilizers and Composts—***Joji Muramoto, Organic Production CE Specialist, UC Santa Cruz*

8:30 **Using Weather-Based Irrigation Scheduling for Optimizing Artichoke and Cabbage Production—***Michael Cahn, UCCE Irrigation Advisor, Monterey County*

9:00 **Navigating the State Water Efficiency (SWEEP) and Healthy Soils (HSP) Grant Programs—***Aparna Gazula, UCCE Small Farm Advisor, Santa Clara County*

9:30 **Update on AgOrder 4.0—***Monica Barricarte, Environmental Scientist, Central Coast Regional Water Quality Control Board*

10:00 **Break**

10:15 **Progress in Implementing the Sustainable Ground Water Management Act (SGMA) in the Salinas Valley—***Emily Gardner, Deputy General Manager, Salinas Valley Basin Groundwater Sustainability Agency*

10:35 **Third Party Program for Ag Order 4.0—***Sarah Lopez, Executive Director, Central Coast Water Quality Preservation Inc.*

10:55 **Factors Affecting the R Side of the A-R Metric Equation in Ag Order 4.0—***Richard Smith, UCCE Weed and Vegetable Advisor, Monterey County*

11:30 **Update on Using Polyacrylamide (PAM) for Controlling Sediment and Pesticides in Irrigation Runoff—***Michael Cahn, UCCE Irrigation Advisor, Monterey County*

12:00 **Adjourn**

Comments: 0

App.2.4: 2022 Irrigation and Nutrient Management Meeting announcement

October 25 - Day One (optional)

1:00 pm – 4:00 pm Kearney Agriculture Research and Extension Center Tour

October 26 - Day Two

Facilitator: Dr. Rob Mikkelsen, Yara North America

9:00 - 9:30 Welcome
Renee Pinel – President/CEO Western Plant Health
Karen Ross – Secretary, California Department of Food and Agriculture

9:30–10:00 Crop Nitrogen Removal Coefficients
Daniel Geisseler – Specialist in Nutrient Management, University of California Cooperative Extension

10:00–10:30 Achieving Efficient Nitrogen Fertilizer Management in California Wheat
Mark Lundy – Assistant Specialist, University of California Cooperative Extension

10:30-10:50 Break

10:50-11:20 Assessing Drip Irrigation and Nitrogen Management of Fresh Onions Produced in California Low Desert
Jairo Diaz – Desert Research and Extension Center Director University of California Cooperative Extension

11:20-11:50 Evaluation of Nitrogen Uptake and Applied Irrigation Water in Asian Vegetables
Aparna Gazula – Small Farm Advisor, University of California Cooperative Extension

App. 2.5: 2022 FREP/WPH Nutrient Management Conference announcement

11:50–1:10 Lunch

1:10–2:25 Panel: Impact of High Input Costs on Nitrogen Management
Moderator: Tom Bottoms – Operations Manager, Timothy and Viguie Farming
Panelists: TBD

2:25–2:45 Break

2:45–4:15 Breakout Sessions
Groundwater Protection Targets
Kenneth Miller, Formation Environmental

Irrigation Management in Nursery Production
Loren Oki – Associate Specialist, University of California Cooperative Extension

4:15-6:30 Poster Session and Social Hour

October 27 - Day Three

Facilitator: Andy Low, Helena Agri-Enterprises

8:15-8:30 Welcome and Recap

8:30-9:00 Development of Nutrient Budget and Nutrient Demand Model for Nitrogen Management in Cherry
Patrick Brown – Professor of Plant Sciences, University of California, Davis

9:00–9:30 Research Updates on Nitrogen Management in Walnuts
Katherine Jarvis-Shean – Orchard Systems Advisor, University of California Cooperative Extension

9:30–10:00 Using Biosolids-based Fertilizers as a Nitrogen Source in California Small Grains
Konrad Mathesius – Farm Advisor, University of California Cooperative Extension

10:00-10:20 Break

10:20-10:50 Developing a nitrogen mineralization model for organically managed vegetable farms on the Central Coast
Joji Muramoto – Organic Production Specialist, University of California Cooperative Extension

App. 2.6: 2022 FREP/WPH Nutrient Management Conference announcement

UC CE University of California Agriculture and Natural Resources

Practical Training on Nitrogen Planning and Management in Organic Production of Annual Crops

Habrá traducción al Español

About this workshop

In this 3-part series, participants will learn how to estimate nitrogen release from diverse organic sources and translate that knowledge to nitrogen fertilization decision and regulatory reporting requirements. We will cover the most common sources of nitrogen and complete a nitrogen budget

- Virtual event
- Must enroll in all 3 classes
- Cost $25
- Earn 6 hours CCA credits
- Earn 6 hours of CDFA-INMTP CE credits

REGISTER HERE
Limited to 75 participants

3-part workshop
Tuesday, **November 29**
Monday, **December 5**
Monday, **December 12**
1-3 pm

Who should enroll?

Growers, CCAs, PCAs and other agricultural professionals who are interested in learning about nitrogen management in organic production are encouraged to enroll.

November 29, 2022, 1-3 pm Part 1: Understanding nitrogen: the nutrient, the role of microbes and the relevance of soil organic matter. *Presenters: Daniel Geisseler, Radomir Schmidt and Margaret Lloyd*

We will begin with an overview of the sources, transformations and fates of nitrogen in soil. We will discuss the role and dynamics of microbes in nitrogen management, and how that impacts management decisions.

December 5, 2022 1-3 pm Part 2: Estimating nitrogen release from organic amendments and contributions from cover crops. *Presenters: Patricia Lazicki and Margaret Lloyd*

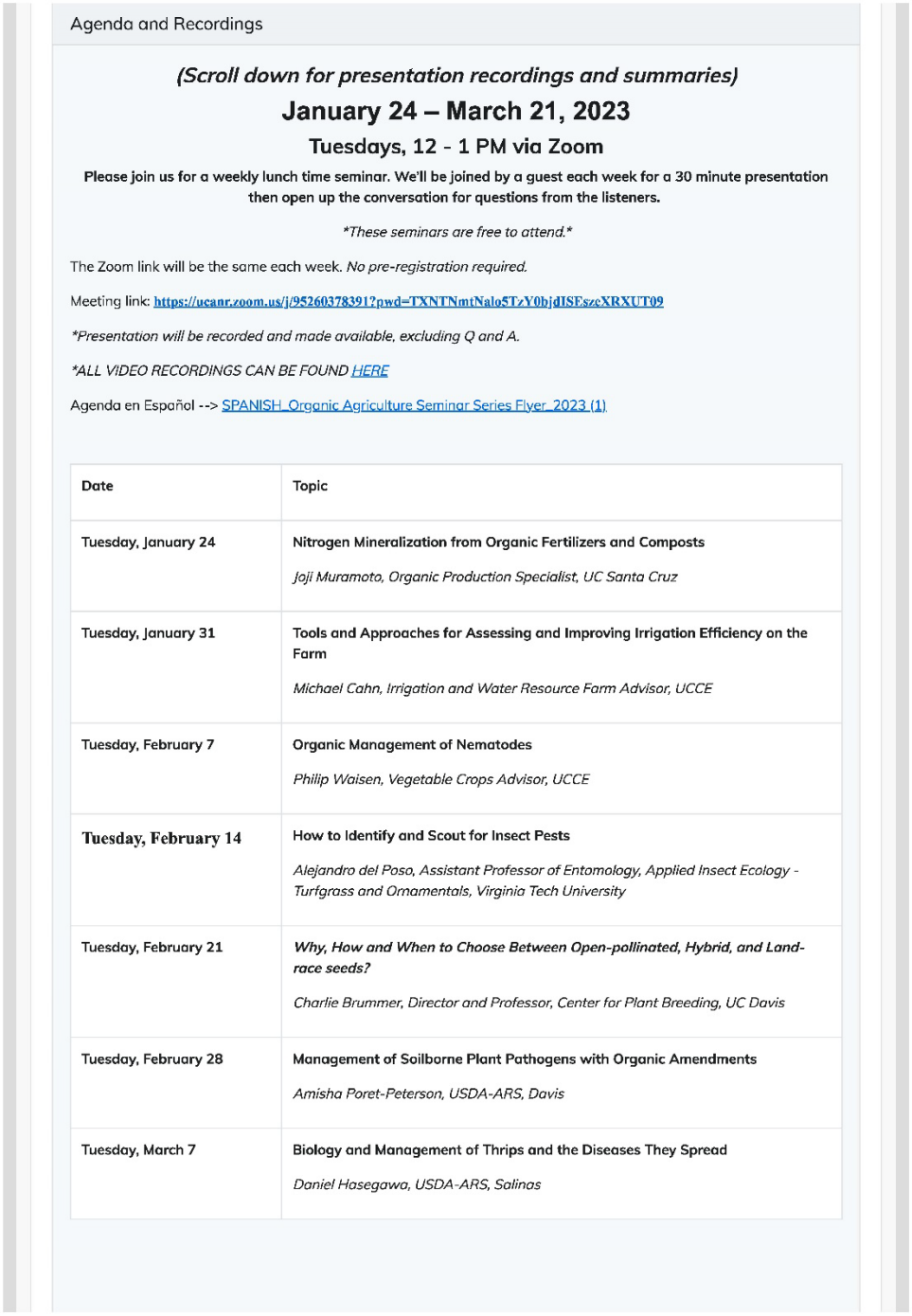
This session focuses on estimating nitrogen release from compost, organic fertilizers, cover crops and crop residue and irrigation water.

December 12, 2022 1-3 pm Part 3: Put it all together: Complete an N budget, synchronize nitrogen release with nitrogen demand, and use soil tests *Presenters: Joji Muramoto, Richard Smith and M. Lloyd*

In this session, we will address nuances of organic soil fertility management in vegetables. Discussions will include crop nitrogen demand and strategies to supply demand, as well as using and interpreting soil testing. Specific references will be made to strategies for complying with forthcoming regulations. We will conclude with a discussion on new frontiers in organic nitrogen management.

App. 2.7: Practical Training on Nitrogen Planning and Management in Organic Production of Annual Crops announcement

App. 2.8: Organic Agriculture Workshop announcement



Agenda and Recordings

(Scroll down for presentation recordings and summaries)

January 24 – March 21, 2023

Tuesdays, 12 - 1 PM via Zoom

Please join us for a weekly lunch time seminar. We'll be joined by a guest each week for a 30 minute presentation then open up the conversation for questions from the listeners.

These seminars are free to attend.

The Zoom link will be the same each week. *No pre-registration required.*

Meeting link: https://ucanr.zoom.us/j/95260378391?pwd=TXNTNmtNalo5TzY0bjdISEszcXRXUT09

**Presentation will be recorded and made available, excluding Q and A.*

**ALL VIDEO RECORDINGS CAN BE FOUND HERE*

Agenda en Español --> SPANISH_Organic Agriculture Seminar Series Flyer_2023 (1)

Date	Topic
Tuesday, January 24	**Nitrogen Mineralization from Organic Fertilizers and Composts** *Joji Muramoto, Organic Production Specialist, UC Santa Cruz*
Tuesday, January 31	**Tools and Approaches for Assessing and Improving Irrigation Efficiency on the Farm** *Michael Cahn, Irrigation and Water Resource Farm Advisor, UCCE*
Tuesday, February 7	**Organic Management of Nematodes** *Philip Waisen, Vegetable Crops Advisor, UCCE*
Tuesday, February 14	**How to Identify and Scout for Insect Pests** *Alejandro del Poso, Assistant Professor of Entomology, Applied Insect Ecology - Turfgrass and Ornamentals, Virginia Tech University*
Tuesday, February 21	***Why, How and When to Choose Between Open-pollinated, Hybrid, and Land-race seeds?*** *Charlie Brummer, Director and Professor, Center for Plant Breeding, UC Davis*
Tuesday, February 28	**Management of Soilborne Plant Pathogens with Organic Amendments** *Amisha Poret-Peterson, USDA-ARS, Davis*
Tuesday, March 7	**Biology and Management of Thrips and the Diseases They Spread** *Daniel Hasegawa, USDA-ARS, Salinas*

App. 2.9: Organic Agriculture Seminar Series for Growers (Event 3)

View the Program

Login

The Western Nutrient Management Conference is proud to display the two-day program. Scroll through the schedule of each day, being sure to click on the Description of any presentation for more detailed information. The conference program has been approved for 7.5 CEU credits!

Please note that all times listed are Pacific Standard Time.

Thu Mar 9, 2023 | Fri Mar 10, 2023

Track 1

Track 2

7:00 AM - 8:00 AM

Breakfast
Room: Bordeaux

7:55 AM - 8:00 AM

Opening Remarks
Moderator: Jared Spackman
Room: Bordeaux

8:00 AM - 8:50 AM

Opening Keynote
Moderator: Jared Spackman
Room: Bordeaux

The Ammonia Rainbow
Alan Blaylock - Nutrien Inc

8:50 AM - 9:00 AM

Break

9:00 AM - 11:00 AM

Breakout Session 1
Moderator: Amber Moore
Room: California/Beaujolais

Nitrogen Availability from Organic Amendments
Daniel Geisseler - University of California, Davis

Flushed Liquid Dairy Manure Solid Particle and Nutrient Distributions
Lide Chen - University of Idaho

Effects of Long-term Biosolids Applications in Two Dryland Agroecosystems on Physical, Biological, and Chemical Soil Health Properties
Madeline Desjardins - Washington State University

Biosolids-based Fertilizers as a Nitrogen Source in California Small Grains Systems
Konrad Mathesius - University of California Cooperative Extension

Breakout Session 2
Moderator: Matt Yost
Room: Burgundy/Cabernet

Impact of Variable-Rate Nitrogen on Potato Yield, Quality, and Profit
Elisa Flint - Utah State University

Floral Hemp Responses to Nitrogen Fertilization in the High Desert
Felipe Barrios Masias - University of Nevada, Reno

1/3

App. 2.10: The Western Nutrient Management Conference (Event 5)

UC CE UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources Cooperative Extension

Vegetable & Organic Production Workshop

April 13, 2023

Location:
Imperial County Farm Bureau (Boardroom)
1000 Broadway, El Centro, CA 92243

Registration link:
https://surveys.ucanr.edu/survey.cfm?surveynumber=39939

	8:00 a.m. – 12:35 p.m.
8:00	Registration
8:30	**Welcome & Introductions** – *Board of Director & Oli Bachie, UCCE Imperial and San Diego County Director*
8:35	**Benefit of drip irrigation for vegetable and organic production** - *Ali Montazar, Irrigation and Water Management Advisor, UCCE Imperial, Riverside & San Diego counties*
8:55	**Weed management for vegetable and organic production** - *Oli Bachie, Agronomy & Weed Management Advisor, UCCE Imperial, Riverside & San Diego Counties*
9:15	**Considerations for organic livestock production** - Brooke Latack, *Livestock Advisor, UCCE Imperial, Riverside & San Bernardino counties*
9:35	**Perspective on cole crop residue as biofumigants for soilborne disease management in vegetable cropping systems** - *Philip Waisen, Vegetable Crops Advisor, UCCE Riverside and Imperial Counties*
9:55	**Organic pest control for crops in Imperial County** - *Michael Rethwisch, Crop Production and Entomology Advisor, UCCE Riverside County*
	Break at 10:15 a.m. (10 minutes)
10:25	**Nutrient management in organic vegetables** - *Milt McGiffen, CE Specialist and Plant Physiologist, UC ANR/UC Riverside*
10:45	**Overview of organic production in California and nitrogen management in organic production** - *Joji Muramoto, Organic Production Specialist, UC ANR/UC Santa Cruz*
11:05	**Updates on the UC organic agriculture institute activities and grower survey** - *Houston Wilson, Director - Organic Agriculture Institute, Asst. Cooperative Extension Specialist, UC Riverside*
11:35	**Organic vegetable field trials to assess food safety and biological soil amendments of animal origin** - *Michele T Jay-Russell, Researcher, Western Center for Food Safety, UC Davis*
11:55	**Insect pest management options for organic production system** – *Eric Middleton, UCCE Area IPM Advisor, UCCE San Diego*
12:15	**Food surface and liquid decontamination technologies for organic production** – *Jimmy Nguyen, Food Safety and Organic Production Advisor, UCCE Imperial & Riverside Counties*

For additional information on the workshop, please contact organizers Jimmy Nguyen, cgnguyen@ucanr.edu & Ali Montazar, amontazar@ucanr.edu and Oli Bachie, obachie@ucanr.edu or call us at (442) 265-7700

Approved Continuing Education Units:
CALIFORNIA DPR (Course ID #M-0624-23 - 1.5 hrs.), Arizona Dept. of Agriculture (Course ID #23920 - 1.5 hrs.) & Certified Crop Advisor (Tracking No. CA60351 - 2.0 hrs.)

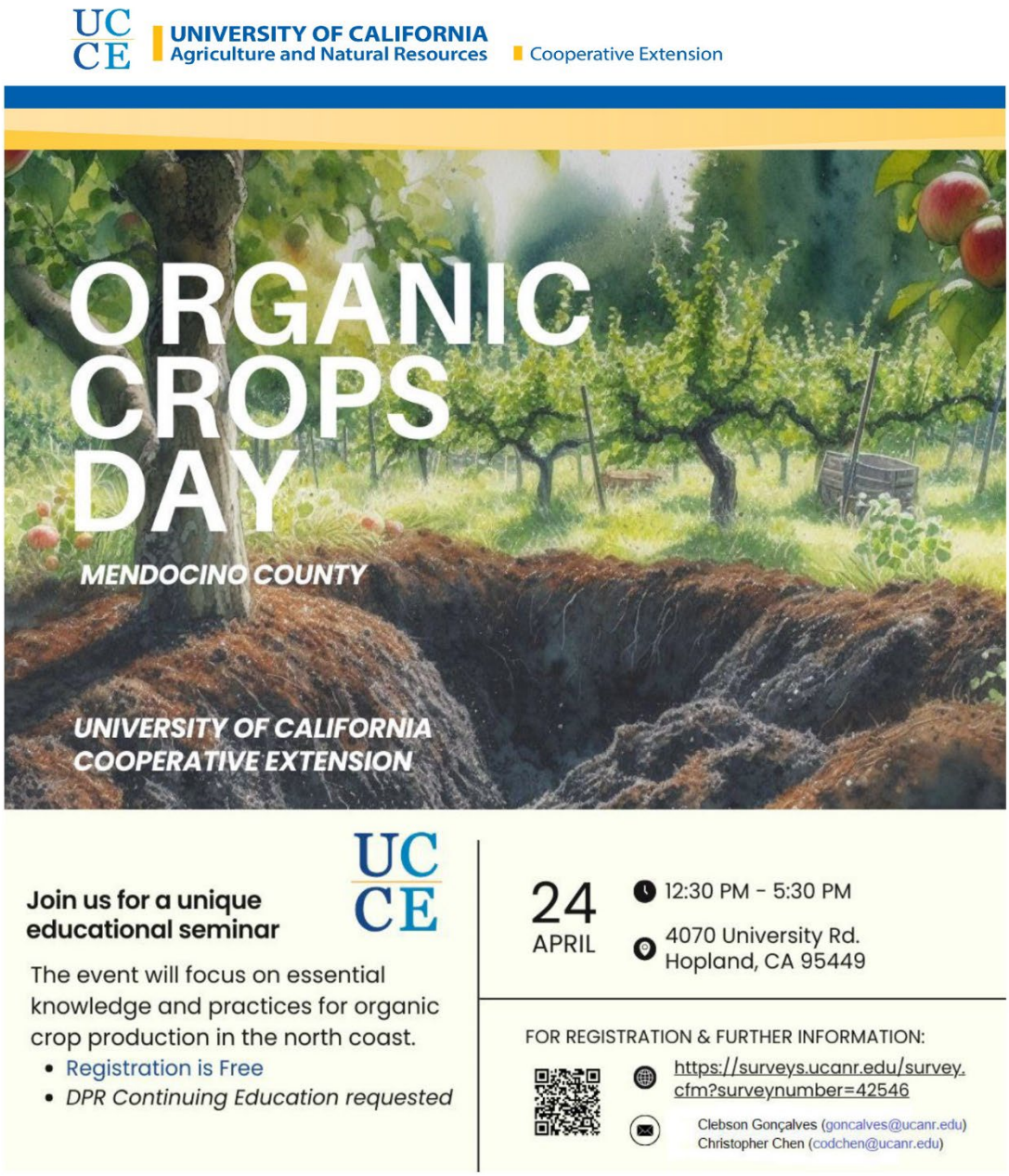
App. 2.11: Vegetable and Organic production Workshop (Event 6)

Ventura CAPCA CE Meeting Agenda September 20th, 2023 8:15am-3:00pm

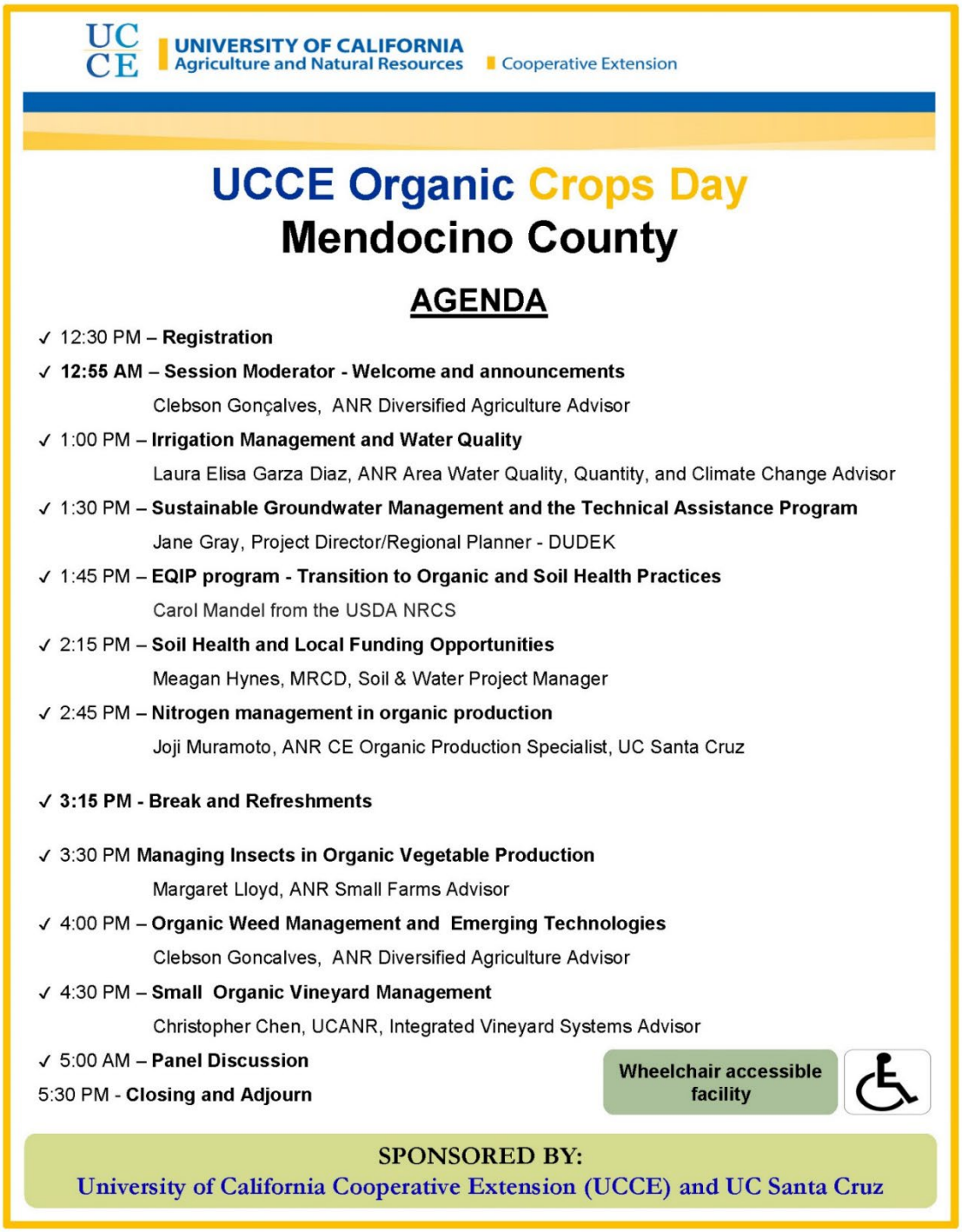
8:15	Andreas Neuman	UAV-IQ	30 min
8:30			
8:45	Ruthann Anderson	CAPCA	30 min
9:00			
9:15	Mike Stanghellini	TriCal, Inc.	60 min
9:30			
9:45			
10:00			
10:15	Ben Faber	UCANR	30 min
10:30			
10:45	Break		15 min
11:00	Tommy Escalante	CERTIS	30 min
11:15			
11:30	Ines Bazan	LIDA	30 min
11:45			
12:00	Lunch		
12:15			
12:30	Joji Muramoto	UCANR	60 min
12:45			
1:00			
1:15			
1:30	Robert Straser	UCANR	30 min
1:45			
2:00	Sean Pelham	Suterra	30 min
2:15			
2:30	Jay Sughroue	BioSafe Systems	60 min
2:45			
3:00			

App. 2.12: Ventura CAPCA CE Meeting (Event 7)

App. 2.13: Practical Training in Nitrogen Planning and Management in Organic Production of Annual Crops (Event 8)



App. 2.14: UCCE Organic Crop Day, Mendocino County (Event 1. Objective 5)



UC CE UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources Cooperative Extension

UCCE Organic Crops Day
Mendocino County

AGENDA

✓ 12:30 PM – **Registration**

✓ **12:55 AM – Session Moderator - Welcome and announcements**
Clebson Gonçalves, ANR Diversified Agriculture Advisor

✓ 1:00 PM – **Irrigation Management and Water Quality**
Laura Elisa Garza Diaz, ANR Area Water Quality, Quantity, and Climate Change Advisor

✓ 1:30 PM – **Sustainable Groundwater Management and the Technical Assistance Program**
Jane Gray, Project Director/Regional Planner - DUDEK

✓ 1:45 PM – **EQIP program - Transition to Organic and Soil Health Practices**
Carol Mandel from the USDA NRCS

✓ 2:15 PM – **Soil Health and Local Funding Opportunities**
Meagan Hynes, MRCD, Soil & Water Project Manager

✓ 2:45 PM – **Nitrogen management in organic production**
Joji Muramoto, ANR CE Organic Production Specialist, UC Santa Cruz

✓ **3:15 PM - Break and Refreshments**

✓ 3:30 PM **Managing Insects in Organic Vegetable Production**
Margaret Lloyd, ANR Small Farms Advisor

✓ 4:00 PM – **Organic Weed Management and Emerging Technologies**
Clebson Goncalves, ANR Diversified Agriculture Advisor

✓ 4:30 PM – **Small Organic Vineyard Management**
Christopher Chen, UCANR, Integrated Vineyard Systems Advisor

✓ 5:00 AM – **Panel Discussion**

5:30 PM - **Closing and Adjourn**

Wheelchair accessible facility

SPONSORED BY:
University of California Cooperative Extension (UCCE) and UC Santa Cruz

App. 2.15: UCCE Organic Crop Day, Mendocino County (Event 1. Objective 5)

App. 2.16: UCCE Organic Farming workshop, Lake County (Event 2. Objective 5)

App. 2.17: UCCE Organic Farming workshop, Lake County (Event 2. Objective 5)

App. 2.18: UCCE Organic Crops Day, Sonoma County (Event 3. Objective 5)

UCCE Organic Crops Day Sonoma County

Date: Friday April 26, 2024
Time: 8:30am-12:30pm

Location: Sonoma County Farm Bureau
3589 Westwind Blvd.
Santa Rosa, CA 95403

Cost: Free

Attendees: commercial & nonprofit vegetable, orchard, and grape growers, PCAs & CCAs from Sonoma County

Simultaneous Spanish Translation provided
DPR, CCA, and INMP CEUs are requested

Agenda

8:00-8:30 Registration

8:30-9:00 Soil Health Management in Organic Systems - Noely Gonzalez-Maldonado, UC Davis PhD Candidate, Soils and Biogeochemistry, Founder of Women in Ag Science

9:00-9:30 Organic Nitrogen Management - Dr. Joji Muramoto, Cooperative Extension Specialist

9:30-10:00 Organic IPM for Insect Pests in Orchards & Vineyards - Dr. Cindy Kron, North Coast Area IPM Advisor (DPR CE category: O)
This talk will focus on integrated pest management strategies for insect pests in organic orchards and vineyards in this region, including pest identification, scouting, and available tools (including organic-approved pesticides) and their integration.

10:00-10:25 Organic IPM for Insect Pests in Vegetable Crop Systems - Dr. Ellie Andrews, Specialty Crops Advisor for Sonoma, Marin, and Napa counties (DPR CE category: O)
This talk will cover integrated pest management strategies for insect pests in organic vegetable systems in this region, including pest identification, scouting, and available tools (including organic-approved pesticides) and their integration.

– 10 minute break –

10:35-11:00 Organic Management for Diseases & Weeds - Dr. Chris Chen, Viticulture Advisor for Sonoma, Mendocino, and Lake Counties (DPR CE category: O)
This presentation will discuss tools for disease and weed management in organic vineyards in this region. This includes disease and weed identification, organic-approved pesticides and herbicides, and cultural and biological management methods.

11:00-11:30 Free Technical Assistance to Eligible Small Farmers in SGMA Regulated Basins - Matt Naftaly, Project Director/Regional Planner, SGM Technical Assistance Program, Dudek

App. 2.19: UCCE Organic Crops Day, Sonoma County (Event 3. Objective 5)

Join us this year for the 2024 Practical Training of Nitrogen Planning and Management in Organic Production of Annual Crops!

- Cost: $30
- Must be able to attend all four sessions.
- Limited to only 80 attendees. Register soon!
- Virtual Event: Must register for Zoom information.
- Habrá traducción al Español - Live Spanish Translation will be provided!

(No one will be turned away due to lack of funds. Please email us to inquire)

- **Earn 6 hours of CDFA-INMTP continuing education credits** (formerly CURES CE Credits)
- **Earn 6 hours CCA credits**

About this workshop:
In this 4-part series, participants will learn how to estimate nitrogen release from diverse organic sources and translate that knowledge to nitrogen fertilization plans and regulatory reporting requirements. Over the first 3 sessions, we will cover the most common sources of nitrogen and complete a nitrogen budget. In session 2, participants will be able to work on and receive feedback on their own nitrogen budgets. In session 4, participants will hear from growers about how they manage nitrogen and develop a budget.

Who should enroll?
Growers, CCAs, PCAs and other agricultural professionals who are interested in learning about nitrogen management in organic production are encouraged to enroll.

Click here to Register!
https://na.eventscloud.com/2024nitrogen

App. 2.20: UCCE Organic Crops Day, Sonoma County (Event 5. Objective 5)

Dates & Times	Session Title
Monday, November 18, 1:00-3:00 PM (PT)	**Part 1**: Understanding Nitrogen: The Nutrient, the Role of Microbes and the Relevance of Soil Organic Matter We will begin with an overview of the sources, transformations and fates of sources of organic nitrogen in soil. Foundational to this, we'll cover the role and dynamics of microbes in nitrogen management, and how that impacts management decisions. Lastly, we'll discuss using nitrogen budgets to understand the sources and proportions of available nitrogen to meet crop demand. Speakers: Daniel Geisseler, Radomir Schmidt and Margaret Lloyd
Monday, November 25, 1:00-3:00 PM (PT)	**Part 2**: Estimating Nitrogen Release from Organic Amendments and Contributions from Cover Crops This session will focus on estimating nitrogen release from compost, organic fertilizers and cover crops. In addition, participants will be invited to apply the training to their own operations and receive feedback on the budget calculations during this session. Speakers: Patricia Lazicki and Margaret Lloyd
Monday, December 02, 1:00-3:00 PM (PT)	**Part 3**: Putting It All Together: Completing a Nitrogen Budget, Synchronizing Nitrogen Release with Nitrogen Demand, and Using Soil Tests In this session, we will address specific aspects of organic soil fertility management in vegetables. Discussions will include nitrogen in irrigation water, managing water for nitrogen optimization, crop nitrogen demand and strategies to supply demand, as well as using and interpreting soil testing. Specific references will be made to strategies for complying with forthcoming regulations. We will conclude with a discussion on new frontiers in plant's nitrogen acquisition science. Speakers: Daniel Geisseler, Joji Muramoto, Michael Cahn and Margaret Lloyd
Monday, December 09, 1:00-3:00 PM (PT)	Open House/Grower Panel

App. 2.21: UCCE Organic Crops Day, Sonoma County (Event 21)

Joji Muramoto <joji@ucsc.edu>

Invitation to Speak at UC Master Gardener Initial Training Course 2025 - Santa Clara County

16 messages

Katherine Uhde <kuhde@ucanr.edu> Thu, Aug 1, 2024 at 4:35 PM
To: Joji Muramoto <jmuramoto@ucanr.edu>, joji <joji@ucsc.edu>
Cc: Lucy Diekmann <lodiekmann@ucanr.edu>

Hi Dr. Muramoto -

I hope you have been enjoying the summer. The Master Gardeners in Santa Clara County enjoyed your presentation a couple of months ago so much, they would like to invite you back to teach the Soil and Fertilizer Management class in our upcoming initial training course for new Master Gardeners.

The class would be based on Chapter 3 of the California Master Gardener Handbook-2nd Edition. We also welcome you to talk about your research and extension programs at UC Santa Cruz.

The date of the class is **Thursday, January 30, 2025 from 6:00-9:00 p.m.** on Zoom. Your presentation would be 1.5-2 hours including time for participation and questions.

If you're interested and available, please let me know and we can go over the topic learning objectives and other details.

Thank you -

Katherine Uhde (she/her)
Master Gardener Program Manager

UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources | UC Master Gardener Program

UCCE Santa Clara County
1553 Berger Dr., 2nd Floor
San Jose, CA 95112
Email: kuhde@ucanr.edu
Phone: 408-282-3138
Mobile: 530-492-5826
https://www.mgsantaclara.ucanr.edu
Make a Gift

Joji Muramoto <joji@ucsc.edu> Thu, Aug 1, 2024 at 6:21 PM
To: Katherine Uhde <kuhde@ucanr.edu>
Cc: Joji Muramoto <jmuramoto@ucanr.edu>, Lucy Diekmann <lodiekmann@ucanr.edu>

Hi Katherine,

Thank you for reaching out.

App. 2.22: Santa Clara County Master Gardener Soil and Fertilizer Management Class (Event 22)

App. 2.22: UCCE Transition to Certified Organic Workshop, Siskiyou County (Event 23).

Practical Training on Nitrogen Management in Organic Production of Annual Crops

Tuesday, December 9th 2025
9 am-2 pm

@ Woodland Community College
2300 E Gibson Rd, Woodland
lunch provided

or
Remote by Zoom

- **Cost $20** (Free for farmers)
  *Lunch included for in-person participants
- **Earn CE credits**
  - 4 hours of CCA
  - 4 hours of INMTP

ABOUT THIS WORKSHOP

Participants will learn how to estimate nitrogen release from diverse organic sources & translate that into nitrogen fertilization decisions and reporting. We will cover the most common sources of nitrogen and complete a nitrogen budget.

- **Understanding nitrogen dynamics**
  The nutrient, the role of microbes and the relevance of soil organic matter.
- **Predicting nitrogen availability**
  How much nitrogen releases from organic amendments, compost and cover crops.
- **Nitrogen budgeting**
  Putting it all together: N budgeting, synchronizing N release with N demand, role of water, and soil testing.

WHO SHOULD ATTEND?

- Farmers
- PCA, CCA, ag consultants
- Technical assistance providers

REGISTER HERE
Limited spaces
Registration required

Margaret Lloyd
530-564-8642
mglloyd@ucanr.edu

UC Cooperative Extension
University of California
Agriculture & Natural Resources

App. 2.23: Practical Training on Nitrogen Management in Organic Production of Annual Crops, Siskiyou County (Event 24. Page 1).

ABOUT THE PRESENTERS

Daniel Geisseler is a Cooperative Extension specialist in the Department of Land, Air and Water Resources at UC Davis. Daniel's research and outreach focuses on nutrient turnover and plant nutrition in agricultural systems. He is interested in the effects that different management practices have on nutrient use in California crops and how nutrient use efficiency can be improved, particularly with nitrogen.

Patricia Lazicki is a UCCE Vegetable Crops Advisor for Yolo, Solano, and Sacramento Counties. Her research focuses on soil health and fertility in organic cropping systems. Previously, as a soil science researcher, she worked to develop the nitrogen guidelines for crops throughout California.

Margaret Lloyd is the UCCE Small Farms Advisor for Yolo, Solano and Sacramento Counties. Her research and outreach focuses on the needs of organic vegetable farms. Margaret has spent the last several years on understanding nitrogen management in organic tomato production.

Joji Muramoto is an associate Cooperative Extension Organic Agriculture Specialist based at UC Santa Cruz. His research and extension focus on fertility and soilborne disease management in organic vegetables and strawberries. He networks with organic systems researchers across the state to better serve organic communities throughout California.

Amélie Gaudin is Professor of Agroecology in the Department of Plant Sciences at UC Davis. Her research focuses on measuring the impacts of diversification, including grazing cropland, on soil health and nutrient cycling functions and implications for sustainability and resilience of agriculture.

Michael Cahn is an irrigation and water resources Farm Advisor for UC Cooperative Extension in Monterey County. His research and extension program focuses on irrigation efficiency, nutrient use of crops, and protecting water quality. He led the development of CropManage, an online decision support tool for irrigation and nutrient management.

App. 2.24: Practical Training on Nitrogen Management in Organic Production of Annual Crops, Siskiyou County (Event 24. Page 2)

M. Factsheet/Database Template

1. Project Title
Developing a nitrogen mineralization model for organically managed vegetable farms on the Central Coast

2. Grant Agreement Number (Assigned by CDFA)
19-0952-000-SA

3. Project Leaders
Joji Muramoto, Richard Smith, Michael Cahn, and Daniel Geisseler

4. Start Year/End Year
2020/2025

5. Location
UCSC, UCD, UCCE Salinas office

6. County
Santa Cruz, Monterey, Yolo

7. Highlights

- We developed a simple nitrogen mineralization model for 8 organic fertilizer types using the existing data.
- The model is available online, freely available to the public in English and Spanish, and to be integrated in CropManage.
- Nitrogen mineralization patterns of soy protein hydrolysate fertilizers and strawberry, Brussels sprouts, and artichoke residues were evaluated.
- The outcomes of this project were disseminated at 24 outreach events to about 1,200 people.

8. Introduction
Organic vegetable production on the Central Coast (Monterey, Santa Cruz, and San Benito Counties) was valued at $390 million in 2017. Organic production continues to expand, driven by optimal climatic conditions in this area and increasing consumer demand. Science-based information on nitrogen (N) management is rarely applied in organic fertilizer programs. Current fertility practices vary widely among growers, which has both economic and environmental ramifications. Further, growers are now required to estimate mineralization rates to complete the mandatory N management plans submitted to the Regional Water Quality Control Board. Still, there is insufficient information on N mineralization of organic fertilizers and amendments under local conditions to do so in an informed way.

CropManage (CM) is an online irrigation and N management decision-support tool originally developed under FREP funding in 2011 and now with more than 1700

registered users. In recent years, the online advisory service has provided more than 1,000 recommendations per month during the production season to vegetable and berry growers, mainly farming in California's coastal valleys. Though initially developed for lettuce, continued research and funding have expanded CM to include other leafy greens (spinach, mizuna, leaf lettuce), cole crops (broccoli, cabbage, and cauliflower), celery, peppers, raspberries, and strawberries. However, CM currently cannot simulate N mineralization from organic fertilizers or amendments.
This project aimed to 1) create a N mineralization database for organic fertilizers and amendments, crop residues, and soil organic matter (SOM), 2) develop a simple N mineralization model using the existing data, 3) evaluate and improve the simple model by field trials and incubation studies, 4) integrate the selected model with CM to simulate N mineralization in organic vegetable production in Coastal California, and 5) conduct outreach to organic vegetable growers in Coastal California.

9. Methods/Management

We compiled existing data on N mineralization from literature and past studies on organic fertilizers and amendments, crop residues, and soil organic matter. Based on the datasets collected, a nitrogen mineralization simulation model using C:N ratio as an input variable was developed for 8 organic fertilizer types. N mineralization for two soy-protein hydrolysate fertilizers, a liquid organic fertilizer, and local crop residues of strawberry, Brussels sprout, and artichoke were examined by laboratory incubation. Two replicated field trials were conducted to evaluate the model's prediction at the field level.

10. Findings

Using 113 datasets from peer-reviewed articles, a two-pool N mineralization simulation model for 8 organic fertilizer types was developed and published in the Journal of Environmental Quality. The model is available online, freely available to the public in English and Spanish. The model's prediction of N mineralization from organic fertilizers under field conditions appeared reasonable, though the N mineralization data from the field trials were highly variable. The integration of the N mineralization model into CM has completed, and a demonstration version is available at dev.cropmanage.ucanr.edu, The present project also confirmed significant variation in the relationships between N mineralization rates and C:N ratios among organic fertilizers and crop residues. For organic fertilizers, we found that SPHFs' N mineralization rates were lower than expected from the known relationships between N mineralization rates and C:N ratios reported in a previous study. For crop residues, our incubation study of N mineralization patterns in strawberry, Brussels sprout, and artichoke residues revealed that the relationships between N mineralization rates and C:N ratios differ among residue types. The outcomes of this project were disseminated at 24 outreach events to about 1,200 people.