

Template for Nitrogen Management Planning

to be performed by growers under

*California Regional Water Quality Control Board, Central Valley Region
Order No. R5-2014-0032, Waste Discharge Requirements General Order for
Sacramento Valley Rice Growers*

Contents

Background

Regulatory Information

Grower Information

Section 1 - Planning info

Section 2 - Results

Section 3 - Completion

Lists

Supplemental information

Background Regulatory Information

This Nitrogen Management Planning Template is submitted by the California Rice Commission to satisfy a requirement in "California Regional Water Quality Control Board, Central Valley Region Order No. R5-2014-0032, Waste Discharge Requirements General Order for Sacramento Valley Rice Growers". Following were principles guiding development of this Template:

1. The process needs to be credible, and balance regulatory requirements with a need for simplicity and efficiency.
2. This Template is specific to irrigated rice production in the Sacramento Valley. As such, it considers factors important in determining appropriate nitrogen (N) rates in this environment (such as straw and water management, crop yield, and planting date), but does not address consumption ratios, or N concentrations in irrigation water or soil, which are not relevant in determining these N rates. Where such differences exist, documentation can either be found in a "Supplemental Information" table that is part of the template, or in the very thorough and useful "Rice Nutrient Management in California" (Publication 3516 by UCANR, aka Williams et al., 2010).
3. Information requested verifies the location and extent of key N management practices.
4. Grower access is facilitated, and CRC effort to process, manage, and report data are minimized by an on-line Tool. Information requested of the grower is reasonably minimized. Calculations are automated wherever possible, historic data are brought forward for review and reference, and, where appropriate, identical information can be entered for multiple fields.
5. The Tool should be useful to the grower, with output providing advice about how much and what type of N to apply.
6. Background calculations will be finalized with the help of technical advisors and programmers once the Template has been fully reviewed by the Regional Board. However, information in the Template should be sufficient so that this review can be completed.
7. The format is similar to the structure and look of the final, online tool. This Excel workbook prints out nicely into a pdf (File/Print/Print Entire Workbook).

Additional information can be found in the "Grower Information" section, below.

Background Grower Information

The CRC Coalition has developed this Nitrogen Management Planning Tool (currently in the form of a template for submittal to the Regional Board) for two main purposes. The first is to provide growers with a useful tool for developing future N application plans, and for reporting previous N applications. The second is to satisfy Waste Discharge Requirements issued by the Central Valley Regional Water Quality Control Board (Regional Board), specifically for irrigation of rice fields. One of the goals of these requirements is to avoid excessive movement of nitrate nitrogen from fertilized rice fields into waters of the state, whether they be on the surface or below ground. Use of the tool by a grower for a field satisfies a portion of these Requirements for that field.

Nitrogen Management Plans are required to be kept on the farm unless areas of high vulnerability of groundwater to pollution by rice fields are identified in the future (none has been to date). Were this to occur, CRC would need to submit a Nitrogen Management Plan Summary Report annually.

The Tool has been structured to collect and provide needed information in an accurate and complete, but also convenient manner. It is hoped that the online tool will be widely accessible, and seem efficient and intuitive. A balance has been struck in an attempt to achieve these goals simultaneously. Drop-down lists are employed, and previously provided information are used whenever possible to automatically fill data so that growers need not search their records for it. Up-to-date research results are built into calculations and suggestions. Field data from the Farm Management Plan is brought in automatically to save CRC and growers time, and to make a better tool. Growers are prompted to download copies of the completed NMP they are required to retain on-site. Data entered by growers can be conveniently reviewed and incorporated into the CRC Coalition database, minimizing staff time needed for the accurate data management and reporting required by the Regional Board.

Where conversions are necessary, they are programmed into the background where possible, or calculators are supplied for the convenience of the grower.

Suggested rates are based on information provided by the grower and research results for managing N in rice fields. Growers are encouraged to consider additional site-specific factors that they and their advisors deem relevant in determining the proper form, timing, placement, and amount of N applications.

The "Other" categories are employed as a way to check and improve choices offered growers in lists. Growers selecting "Other" for an item will be asked to enter the item which they did not find in the list. The Tool will periodically be updated to reflect information provided by growers, new research information, and changes to regulatory requirements.

Straw management is considered to be applied year upon year, so that N liberated through decomposition would be at steady state. Growers who are transitioning straw management systems may need to make additional adjustments to account for N immobilization or mobilization. Organic fertilizers are handled in the same manner, so that growers using them only occasionally may need to make additional adjustments.

Estimate yield modestly, but not too conservatively. A suggested yield relative to M-206 grown in warm regions of the Sacramento Valley, planted in a timely manner, is provided to assist growers in estimating anticipated yield of the variety that they will plant at their anticipated date.

Monitor leaf color and topdress N if indicated. Each season, save or print a copy of your NMP for all of your fields. Retain it for reference and to document nutrient management planning for your fields.

Helpful reminders:

Estimate yield modestly, but not too conservatively.

Monitor leaf color and topdress N if indicated.

Each season, save or print a copy of your NMP for all of your fields. Retain for reference and to document nutrient management planning.

CRC NMP Template

Section 1 - Planning info

Template for Nitrogen Management Planning

Grower ID: **Character entry**

Field*	Previous season preplant fertilizer form ^b	Previous season preplant fertilizer rate (lb or g/ha)	Previous season preplant fertilizer form ^b	Previous season preplant fertilizer rate (lb or g/ha)	Previous season (winter before last cover crop) grower estimated (lb of N/acre)	Previous season (winter before last cover crop) grower estimated (lb of N/acre)	Previous season topdress (lb/acre of ammonium sulfate)	Previous season topdress (lb/acre of ammonium sulfate)	Previous season crop type or rice variety	Previous season yield (ow/acre paddy at 15% moisture content)	Notes on other factors affecting yield of previous crop	Last winter straw mgmt	Last winter straw crop green manure (lb/acre of N/acre)	Planned preplant fertilizer form ^b	Planned rice variety	Planned seeding method	Does cold water affect part of this field?	Suggested % of maximum (200 yield)	Anticipated yield (ow/acre paddy at 15% moisture content)	Anticipated planting date	Microclimate	Product of adjustments
ID 1	AQUA AMMONIA	Numeric (default 0)	Numeric (default 0)	Numeric (default 0)	Numeric (default 0)	Numeric (default 0)	Numeric (default 0)	dropdown list	8.5	8.5	Grower to complete with narrative	Baled	20	AQUA AMMONIA	L-205	DRI seeded	Yes	10%	8.5	6/17/2015	Warm	121%
ID 2																						
ID 3																						
...																						

*Background/lookup data tied to Field ID, which will auto-populate based on Grower ID. Field coverage & location are previously known from the Farm Evaluation. Location is tied to a production zone, one factor in determining the suggested application rate.
 †During data entry, grower will have the opportunity to select "Other" types of fertilizers or blends, and then will be able to enter a custom material name and concentration data for the material that they use. This concentration will be used in calculating N rates.
 ‡Fuels in red indicate grower input of some kind is required. Other fields are populated automatically based on previously obtained data &/or calculation. After first year, certain information will auto-populate based on previous years' responses.
 ††Data entry for columns B and C will ask growers to report all N containing fertilizers applied, which could in some cases be more than one type.
 †††When "other" is selected as a response, this will trigger a prompt to specify, so that CRC will pick up what is missing from lists.

Background Elements Established by CRC

- Lists & lookup tables:
 - Rice varieties, crop classes, planting date, microclimate, seeding method, and straw management types, & N rate influence of each.
 - Synthetic and organic fertilizer forms and N content.
- Instructions:
 - Estimate yield modestly, but not too conservatively.
 - Monitor leaf color and topdress N if indicated.
 - Each season, save or print a copy of your NMP for all of your fields. Retain it for reference and to document nitrogen management planning.
- Assumptions:
 - Ammonium sulfate is used for topdress applications

CRC NMP Template

Section 2 - Results

Field ^a	Suggested N range, preplant+starter+topdress	Previous season total applied N (#acre, preplant+starter+topdress)	Previous season suggested N (#/acre, preplant+starter+topdress)	Previous season planned N (#/acre, preplant+starter+topdress)	Cover crop/ green manure N to account for (lbs of N/acre)	This year planned N rate (#/acre, preplant+starter+topdress)	Do you plan to use plant tissue testing or rice leaf color chart?	Are your fields flooded other than for pesticide application, & pre-harvest?	Recommended water management	Do cold-water affected areas receive a reduced rate of N?	Who assists in developing your crop nitrogen application plan? (Check all that apply)
ID 1	182-219 lb/a-year of N	Calculated from Section 1	From database	From database	From Section 1	130	Yes	Yes	Avoid unnecessary, or unnecessarily prolonged field drainage, especially during the 6 weeks after planting.	*Y/N* for cold-water affected fields. Automatically fills "n/a" for others.	Certified Crop Advisor (CCA)
ID 2											
ID 3											
...											

^aBackground/lookup data tied to Field ID: acreage, location. Location is tied to a production zone, one factor in determining the suggested application rate. Data entry for columns I and J will ask growers to estimate all N containing fertilizers to be applied, which could in some cases be more than one type. When "other" is selected as a response, this will trigger a prompt to specify, so that CRC will pick up what is missing from lists.

Background Elements Established by CRC

- Calculations:
 Previous season N credits, suggested and applied N rates
 Planned season N credits, suggested N and fertilizer rates
 Assumptions:
 Preplant N injected or incorporated.
 Fields are flooded for most of the season.
 Ammonium sulfate is used for topdress applications

Calculators:

Materials conversions:
 Common materials: **AQUA AMMONIA**
 Application rate: 100 gal/acre
 N rate: 144 lb N/a
Total N rate:
 Total applied N rate:
 Preplant N 144 lb N/a
 Starter N 30 lb N/a
 Topdress N 0 lb N/a
 Total applied N 174 lb N/a

% N
 N rate:
 Application rate:
 1.44 lb N/gallon of material
 144 lb N/a
 100 gal/acre

CRC NMP Template

Section 3 - Completion

1	<i>Review results, revise inputs as needed.</i>
2	<i>Confirm that you are satisfied with the NMP and wish to save the work.</i>
3	<i>Save and retain your NMP for this season for your future reference and to document completion.</i>

Background Elements Established by CRC

Outputs:

Digital copy of NMP for grower to retain.

Data to calculate rate of management practice adoption (NMP completion, use of tissue testing and color chart, assistance with NMP, and continuous flood) by township.

Data to report N applied/acre, should this be needed.

CRC NMP Template

Supplemental information		Responsive element
Source	Comment	
Bruce Linquist, UCCE	Consider the contribution of previous straw residue. In earlier papers we showed that fertilizer N rates could be reduced when previous year's straw was incorporated and flooded.	This has been incorporated into Section 1 and will figure into suggested rates.
Bruce Linquist, UCCE	Consider suggestion to avoid using any fertilizer with nitrate. Some growers apply UAN (urea ammonium nitrate).	This recommendation has been included in Section 2 for growers planning to use nitrate-N bearing forms.
Bruce Linquist, UCCE	We do not know the water N levels before we apply N fertilizer. Also, water N levels are low in surface water (you can see the recent paper I sent you). Also in the Liang et al paper, it suggests that the well water is also pretty low in N.	Please see next comment and response.
John Dickey, CPSS, CCA/Ag-California	In addition to the generally low concentrations, there are two other factors preventing irrigation water from contributing significantly to rice crop N budgets. Most N in applied water is in the form of nitrate. To reach rice roots, floodwater must travel through the surface soil layer, in which denitrification rates are extremely high. So even if the nitrate is present in the irrigation water and that water infiltrates & is taken up by the crop, the nitrate will have been stripped away en route. Thus, as with the leaching question, there are multiple factors that make it unlikely that irrigation water nitrate will contribute significantly to the N budget of a rice field.	Irrigation water nitrate has not been referenced, since it does not contribute significantly to rice field N budgets.
John Dickey, CPSS, CCA/Ag-California	An NMP pertains mainly to the upcoming season. However, it is useful to the grower to look at plans in the context of the previous season, and to CRC to know what actually was applied the previous season. The latter may become mandatory if CRC is required to report the total amount of N applied.	The template collects data from the past and upcoming season, and compares them for the grower in the results section.
John Dickey, CPSS, CCA/Ag-California	Anticipated rice crop yield is an important factor in estimating appropriate rates of N fertilization. However, reducing the planning process to a ratio is misleading and unwise for several reasons. No ratio will account for all of the factors considered in developing an N rate, within or beyond this NMP Tool. Simple ratios therefore ignore factors that need to be considered in recommending or evaluating an N rate. Yet their use by growers and regulators for this very purpose is implied when they are calculated.	N ratios are not included in this template. However, the basic influence of crop type and mass on N requirements has been fully accounted for in formulation of suggested N rates.
Bruce Linquist, UCCE	In the recent paper by Liang et al. that we wrote the only thing that we identified that could help is avoiding letting the fields dry down too much within the first 6 weeks or so after planting.	A standard recommendation to avoid unnecessary, or unnecessarily prolonged field drainage, especially during the 6 weeks after planting, will be provided.
Randall Mutters, UCCE	Soil testing for N is unreliable due to the anaerobic growing conditions. Suggest omitting reference to soil testing.	Soil testing has not been referenced, since it is so little used, and of so little value in planning N management in rice. Tissue testing and leaf color monitoring are mentioned, and suggested.