The background features several concentric, curved lines in shades of gray, some solid and some dashed, creating a sense of depth and movement. A blue rectangular box with a white border and a small white triangle pointing downwards at the bottom center contains the title text.

Irrigation and Nutrient Management Reporting

- A brief introduction
 - Dr. Lowell Zelinski
 - PhD UC Davis 1995 Soil Science “Soil-Plant-Water Relations”
- Owner, Precision Ag Consulting
 - Help farmers throughout the central coast comply with Regional Board ILRP requirements
- Central coast member of Statewide Expert Panel on Nitrates
- Suggestions for INMP Reporting Requirements

Nitrogen Applied and Removed

- Applied is fairly straight forward – Use #'s from Total Nitrogen Applied (TNA) Reports
- Removed – much more of a challenge
 - Requires “accurate” estimates of **yield** and **concentration** of N in harvested portion of crop.
 - **Yield** is considered a closely guarded trade secret by most growers – major push back here
 - Methodology to estimate of **concentration** of N is not established and plant analysis labs are unwilling or reluctant to perform this task

Nitrogen Removed – an alternative approach

- Removed = Yield x Concentration
 - For many cool season vegetable (CSV), yields are similar from grower to grower
 - N Concentration is unknown for the dozens of crops grown
- The concentration problem
 - Need to sample and analyze EVERY harvest
 - There are 10,000's of harvests
 - Sampling methodology is unknown
 - Should sample numerous times per harvest to get statistically valid results
 - Personnel and Labs are not available

The Standard Deduction

- I propose that the Regional Board develop a “standard deduction” of N removed
- Survey growers as to what is a good, average yield of the CSV that they grow
- Next slide has methodology of concentration estimation

Concentration estimation

Nutrition Facts	
For a Serving Size of 1 Serving (100g)	
Calories 10	Calories from Fat 0 (0%)
% Daily Value *	
Total Fat 0g	-
Sodium 10mg	1%
Carbohydrates 1g	-
Net carbs 1g	-
Fiber 0g	0%
Protein 1g	

- Most CSV are “food” crops
- Nutritional information exists for all CSV
- When determining “protein” content “protein” is not measured.
- Nitrogen is measured, and a conversion factor is applied
- If you know “protein” (from nutritional information) you can go backwards to get to nitrogen
- We can now estimate Removed: $(\text{Yield}(\text{survey}) \times \text{Concentration}(\text{protein}))$

Applied vs Removed

- East San Joaquin WDR indicates that A/R and A-R should be reported
- We now have a methodology for reporting these values, that only requires some minor arithmetic to report
- The reporting of these values is NOT the best indicator of the effectiveness of changes in nitrogen management
- Why Not?

The fate of N in CSV systems

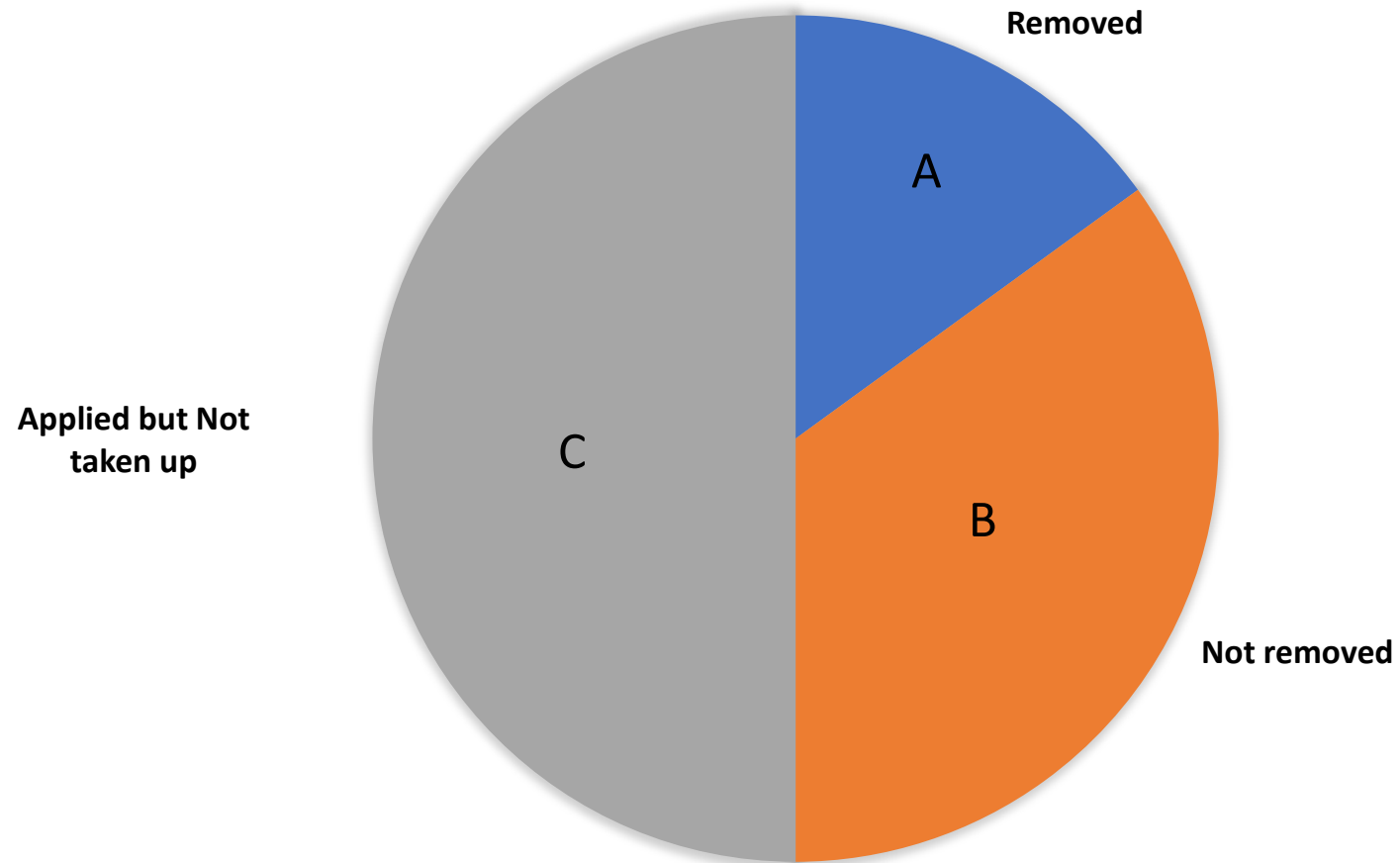
- N applied – simple enough
- N removed – also if previous methodology is adopted – simple enough
- This does not capture the “effectiveness” of nitrogen management changes
- Nitrogen Use Efficiency (NUE) is proposed

Nitrogen Use Efficiency (NUE)

- $NUE = N \text{ taken up} / \text{total N applied}$
- Not a new concept – been around in agronomic crops for decades
- $N \text{ taken up} = N \text{ removed} + N \text{ taken up but not removed}$
- Total N applied – from TNA forms

Nitrogen Use Efficiency
 $NUE = (A+B)/(A+B+C)$

N MANAGEMENT



Example Table

Applied	Applied but not taken up	Removed	Taken up but not removed	NUE
350	250	25	75	28.6%
300	200	25	75	33.3%
250	150	25	75	40.0%
225	125	25	75	44.4%
200	100	25	75	50.0%
175	75	25	75	57.1%
150	50	25	75	66.7%

Note that increasing N Applied does not change removed or taken up but not removed



Increasing NUE
is the Goal

But how is it done?



The Four R's of Fertilizer Management

- Right Rate (100 lbs vs 200 lbs)
- Right Timing (Before Planting vs During Growth)
- Right Placement (Broadcast vs Fertigation)
- Right Form (Ammonium vs Nitrate vs Compost)

Farmers can control these things – They can not control N removed or N required

Summary

- A/R and A-R are good but not as sensitive as NUE
- Farmers can not control A/R or A-R – but can NUE
- Don't forget Standard Deduction concept
- No additional data collection is required with these proposals
- Works for Irrigation Management also – Irrigation Use Efficiency (IUE)