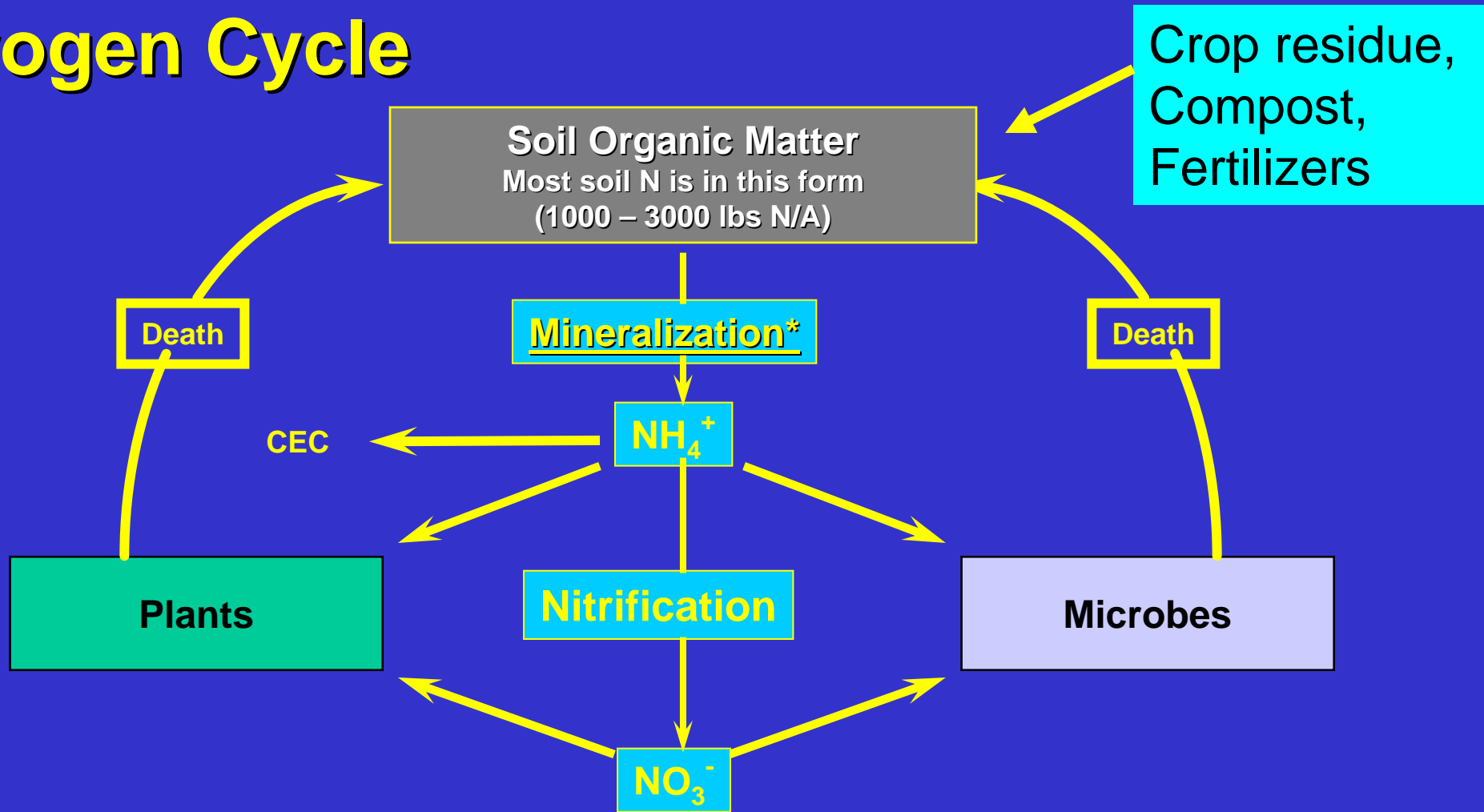


# **Nitrogen Fertility Management in Organic Production**

**Richard Smith, Farm Advisor**

**Monterey, Santa Cruz and San Benito Counties**

# Nitrogen Cycle

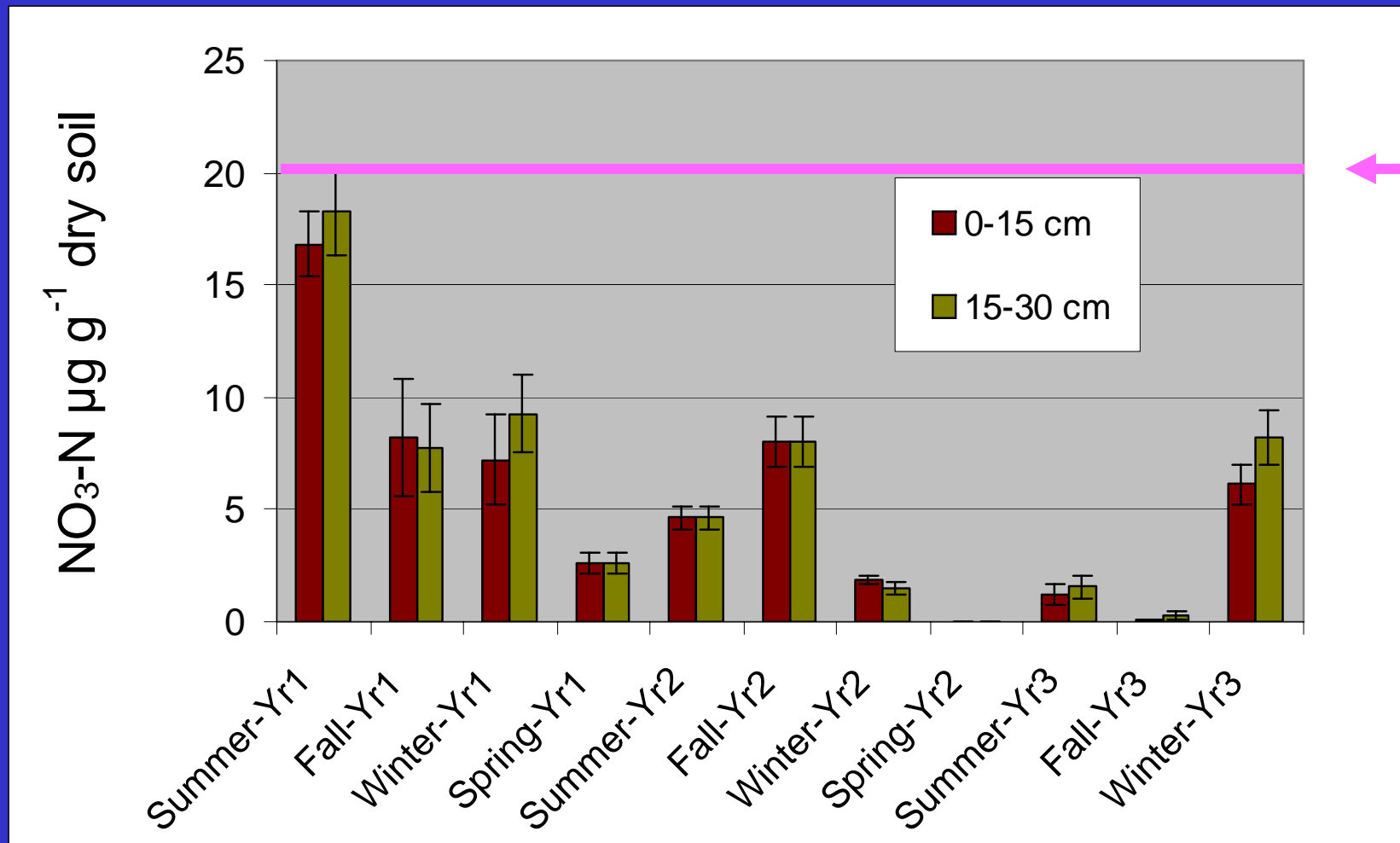


\* Mineralization is a key step in making N available for plant growth  
It is dependent upon adequate soil temperatures (i.e. > 50 F)

# Sources of Nitrogen for Crop Growth

1. Residual mineral N ( $\text{NO}_3\text{-N}$  and  $\text{NH}_4\text{-N}$ )
2. In season mineralization of N from soil organic matter (compost as well)
3. N availability from prior crops & cover crops
4. Organic Fertilizer

# 1. Residual Soil Mineral N (nitrate and ammonium pool)



Jackson, 2005

## **2. In season mineralization of N from soil organic matter**

- 2 to 5 % of soil organic matter decomposes annually**
- As the organic matter decomposes  $\text{NH}_4^+$  and nitrate  $\text{NO}_3^-$  are released**

# **In season mineralization of N from soil organic matter**

- **The mineralization of N from soil organic matter was the source of N for corn in the corn belt in the early days of cultivation**
- **“the economical way to obtain necessary nitrogen supply is to deplete [utilize] the native fertility of the land...”**
  - **Corn and Corn Growing by Wallace and Bressman, 1923**

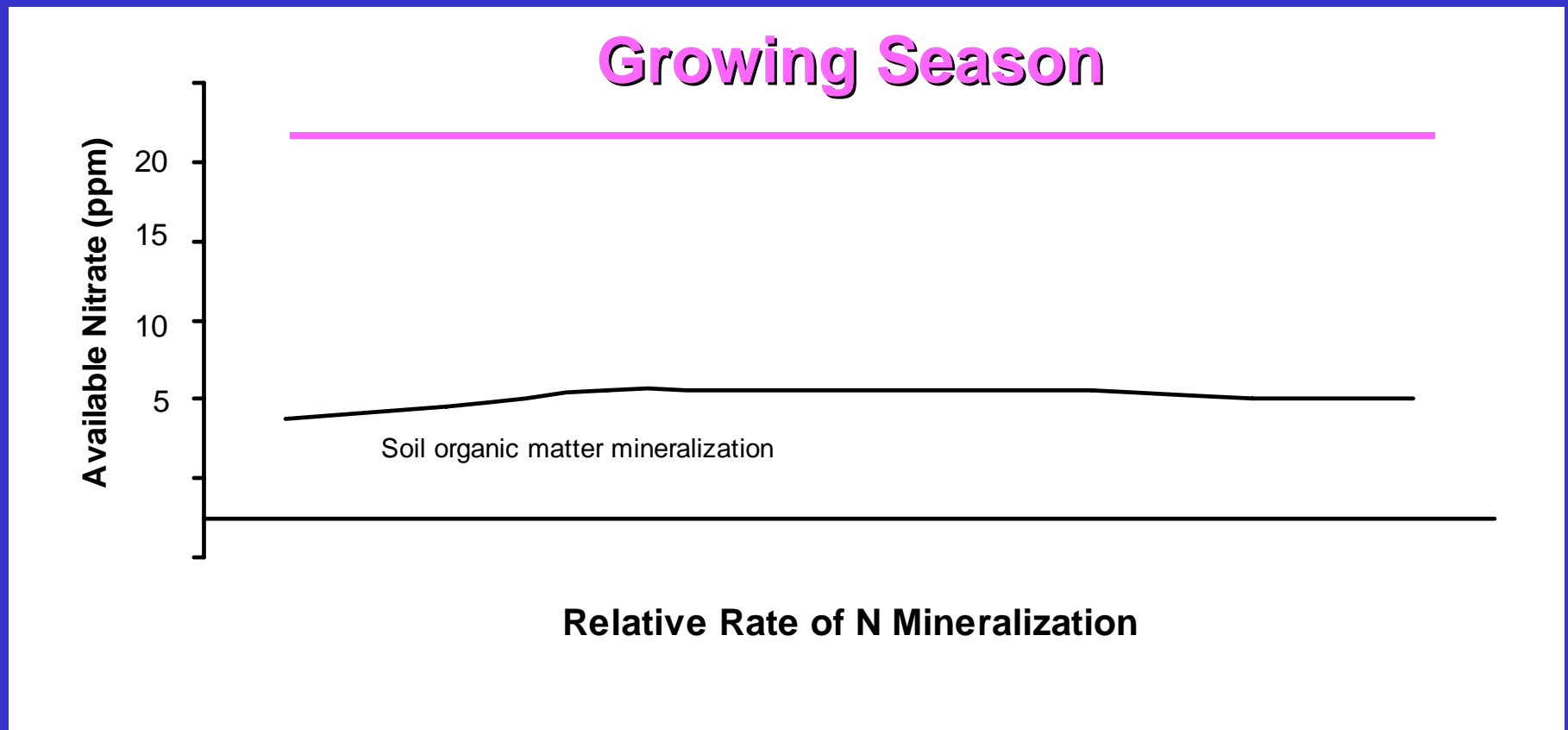
# **In season mineralization of N from soil organic matter**

**For a soil with 1% organic matter:**

- **2,800 lb organic N / acre x 0.02 (percent of organic N that mineralizes in 60 days) =**

**56 lb plant available N / acre  
over two months**

# Nitrogen Release Characteristics of N Soil Organic Matter





# Impacts of Soil Building on Nitrogen Storage in the Soil

Soil Type	Management	Organic Matter %
Clay Loam	Organic	2.24
Clay Loam	Conventional	1.78
Loam	Organic	1.74
Loam	Conventional	1.37
Fine Sandy Loam	Organic	1.31
Fine Sandy Loam	Conventional	0.66

# 3. N availability from cover crops

- Cover crops typically take up or fix between 100-200 lbs N/ acre



**Cover Crop  
Proteins**

Microbes

**Microbes**

Depends upon  
C:N; lignin and  
Polyphenols

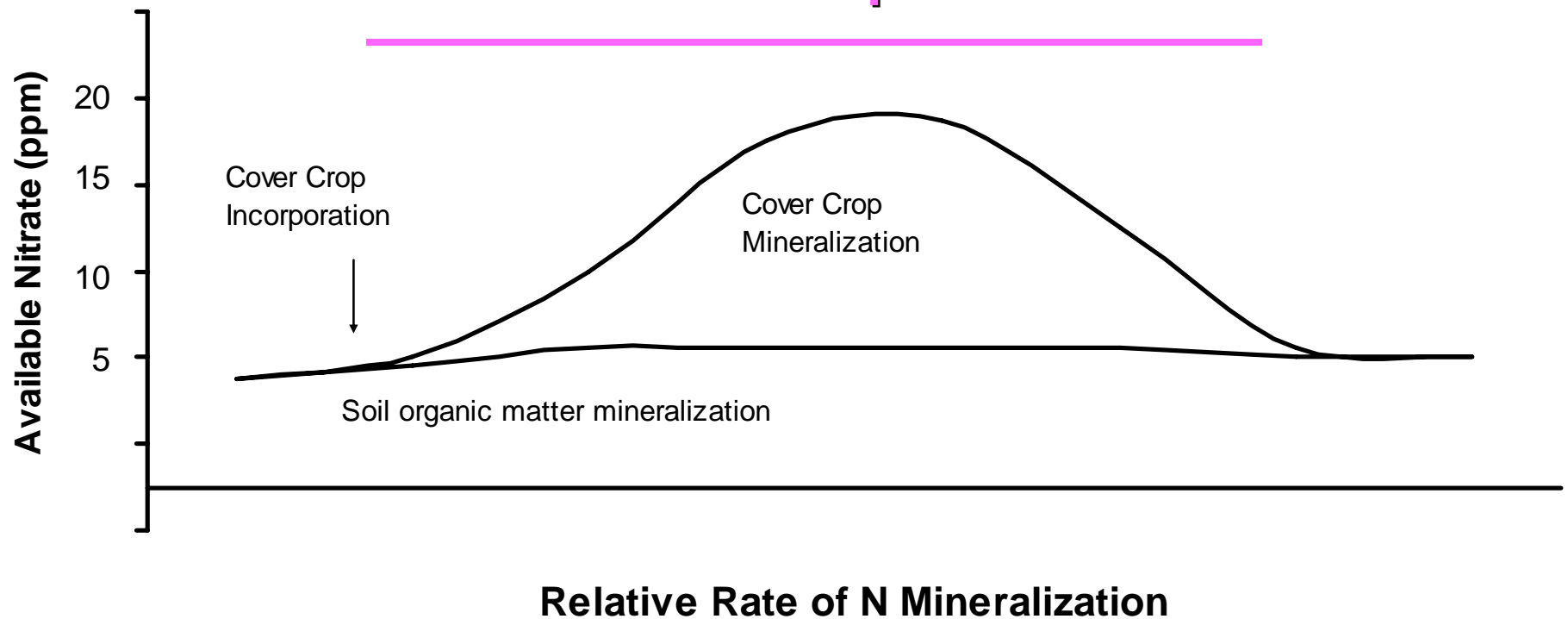
**Available  
Mineral  
Nitrogen**

Typically <10-30% of cover crop  
N is taken up by the first subsequent  
Crop\*

\* A good deal of cover crop N remains in the system and can  
can be taken up in later years (i.e. 73%)

# Nitrogen Release Characteristics of N From Cover Crop

6 – 10 week period



## 4. N Availability from Organic Fertilizers



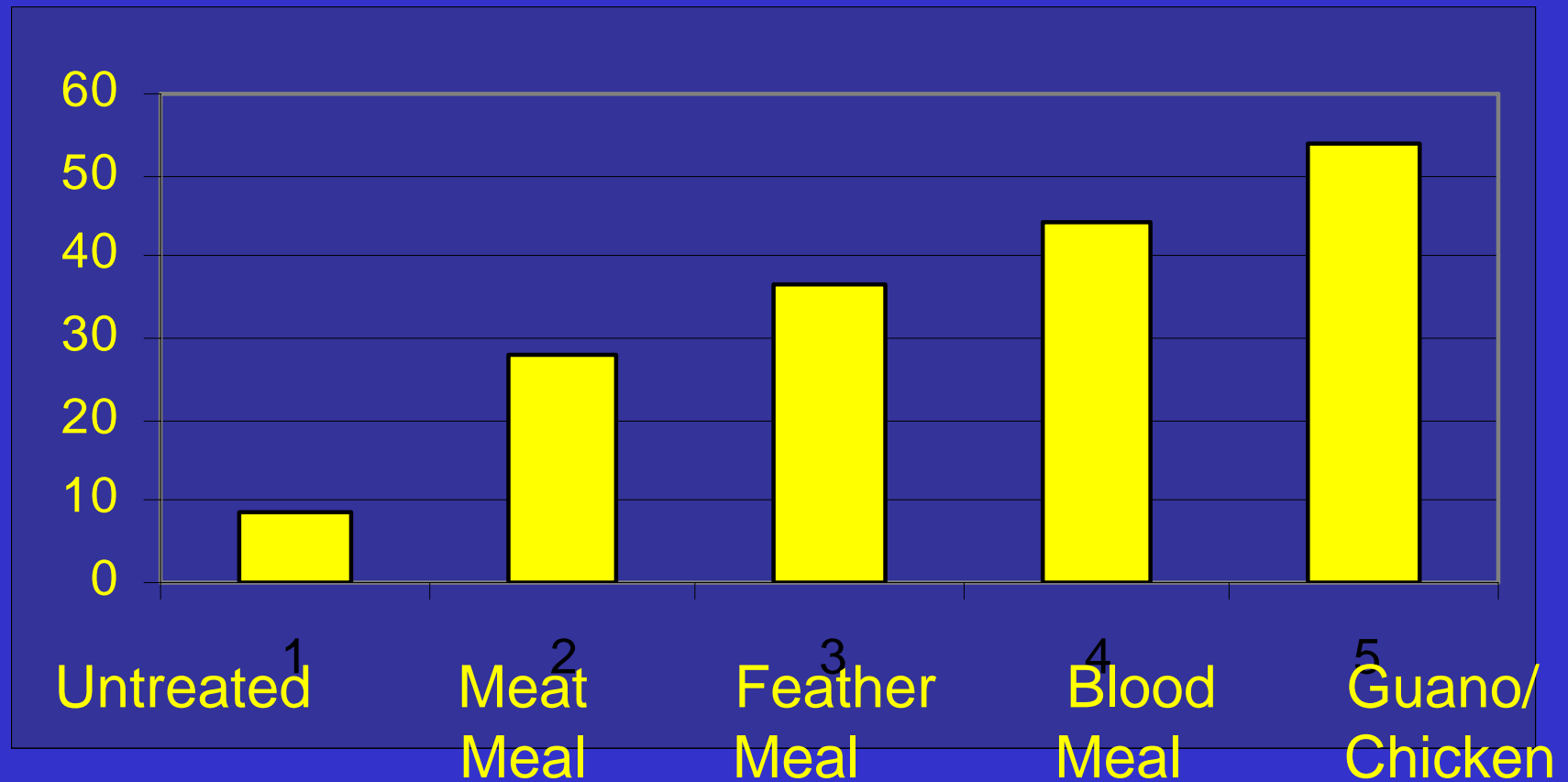
# Organic Fertilizer Form and Timing Trial Watsonville, 2001

Treatment	Preplant May 8	Top dress May 31	Top dress June 7	Top dress June 14	Total
Untreated	0	0	0	0	0
Fert Treat No. 1	45	45	45	45	180
Fert Treat No. 2	90	0	45	45	180
Fert Treat No. 3	135	0	0	45	180

1) Meat Meal 8-5-1;  
3) Blood Meal 13-0-0;

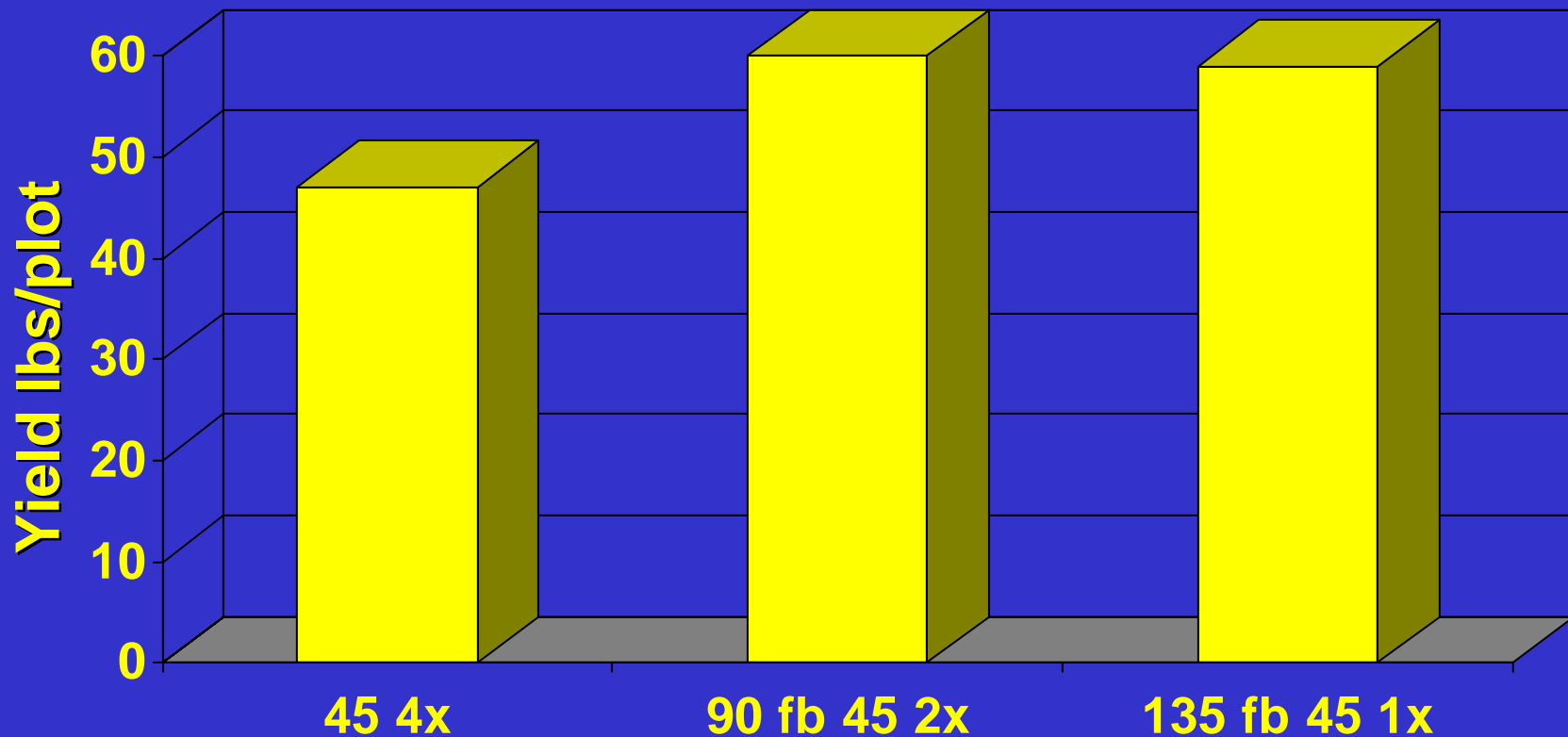
2) Feather Meal 12-0-0  
4) Guano/Chicken 7-0-0

# Total Weight of Heads, Organic Broccoli Watsonville, 2001



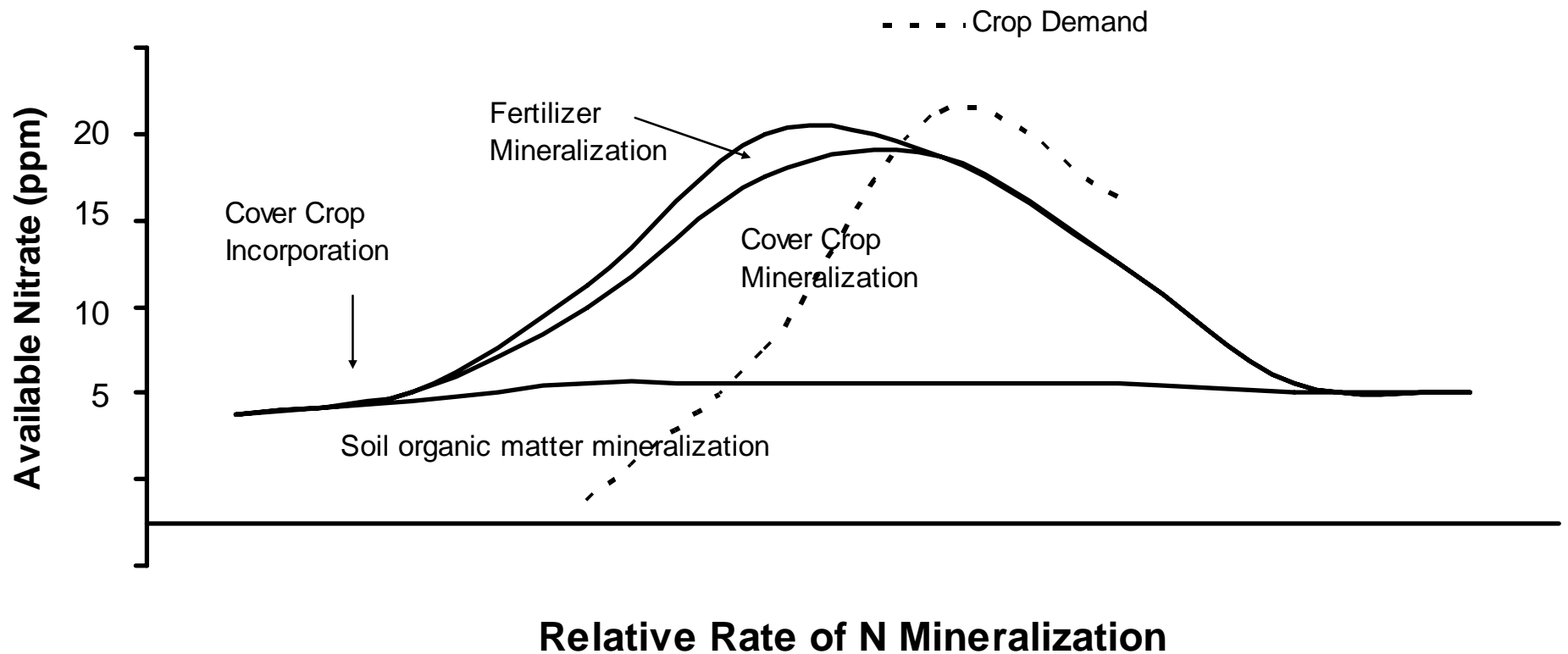
# Effect of Timing of Application of Chicken/Guano Fertilizer

Watsonville, 2001

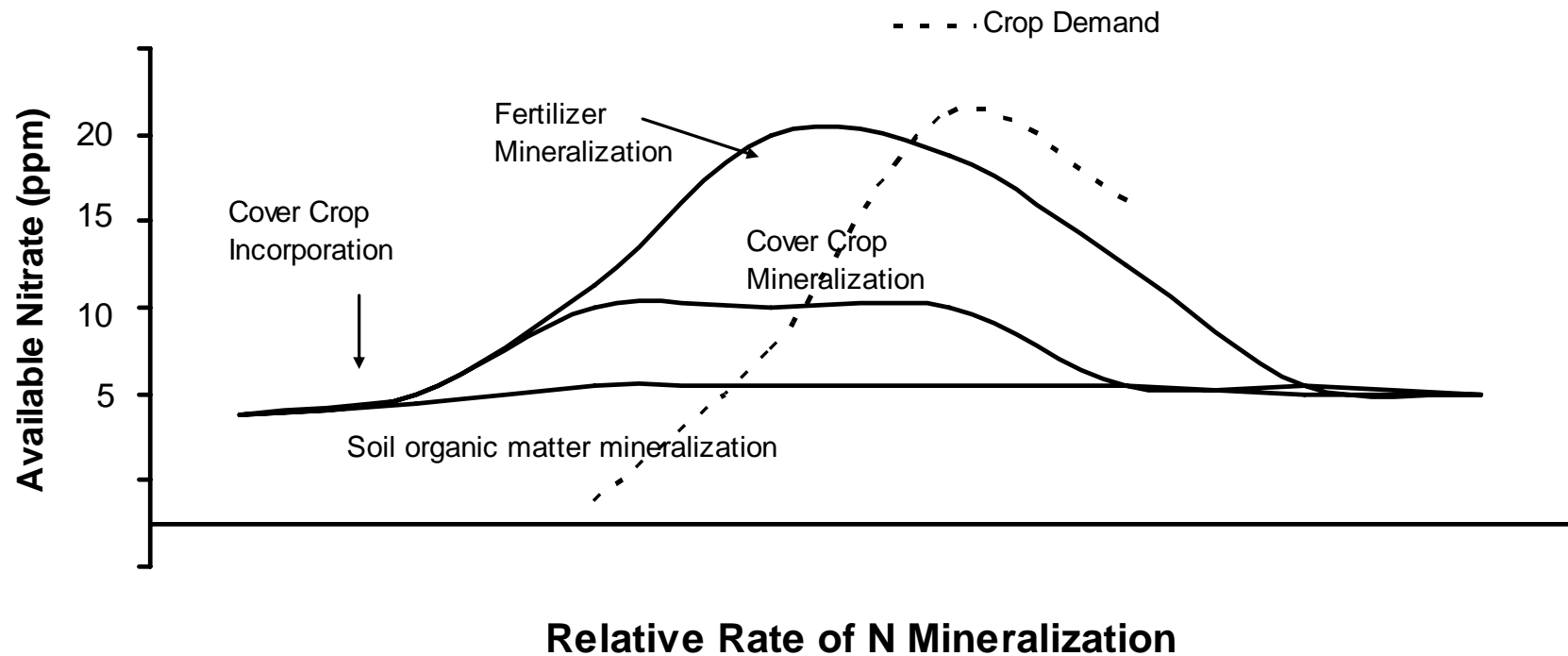




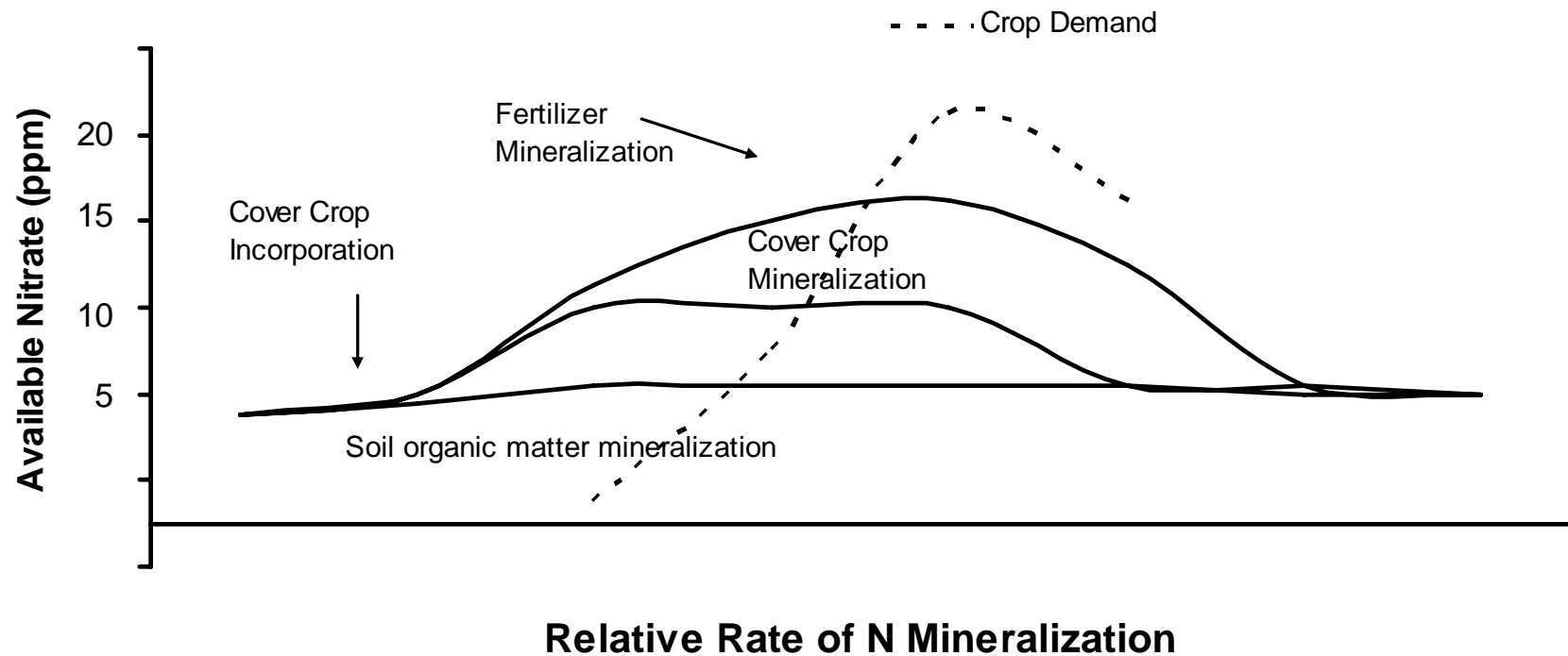
# Effective Synchrony Between Mineralization from the Various Sources and Crop Demand



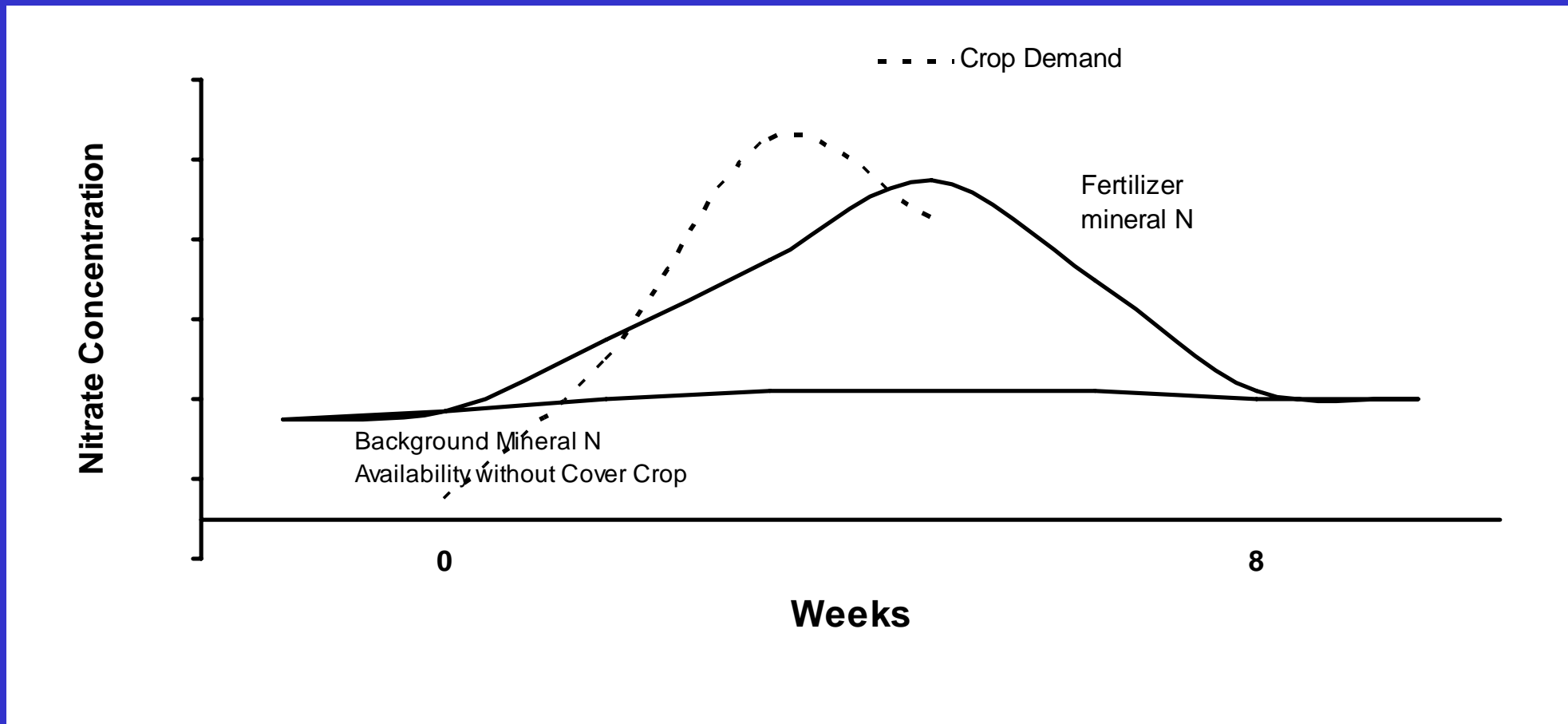
# Low Synchrony form Cover Crop but Good Synchrony of N Release from Fertilizer



# Poor Synchrony between N Availability from Cover Crop and Fertilizer Rate too Low



# Fertilizers Rate is Adequate, but Timing is Out of Synch with Crop Demand (i.e. 4x rate of 45 lbs N/A)



# Integrating All Sources of Nitrogen

- **Achieving effective synchrony between crop uptake and N supplied by mineralization from soil organic matter, cover crop residues and fertilizers is the challenge for managing N fertility of vegetables in organic systems**

