In-Season Nitrogen Fertilization for Caneberries

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Concentrate on Nitrogen – organic N is challenge

- *Nitrogen is often most critical limiting factor for vigor quality*
- *Nitrogen status constantly transformed*
- *Phosphorus, potassium less problematic*
- *Conventional N management comparatively simple*

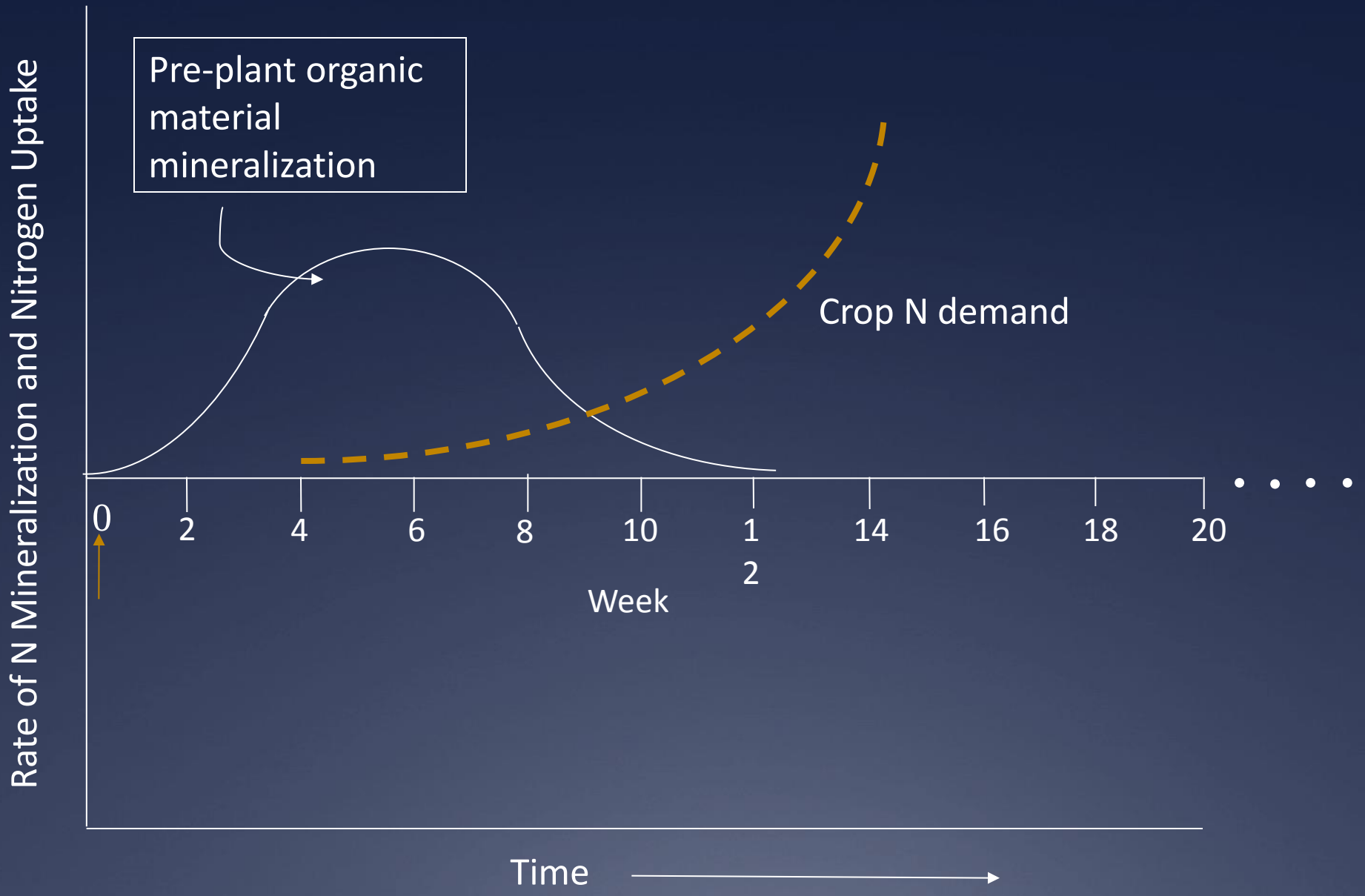
  soluble, inexpensive nitrate – excess more of a problem

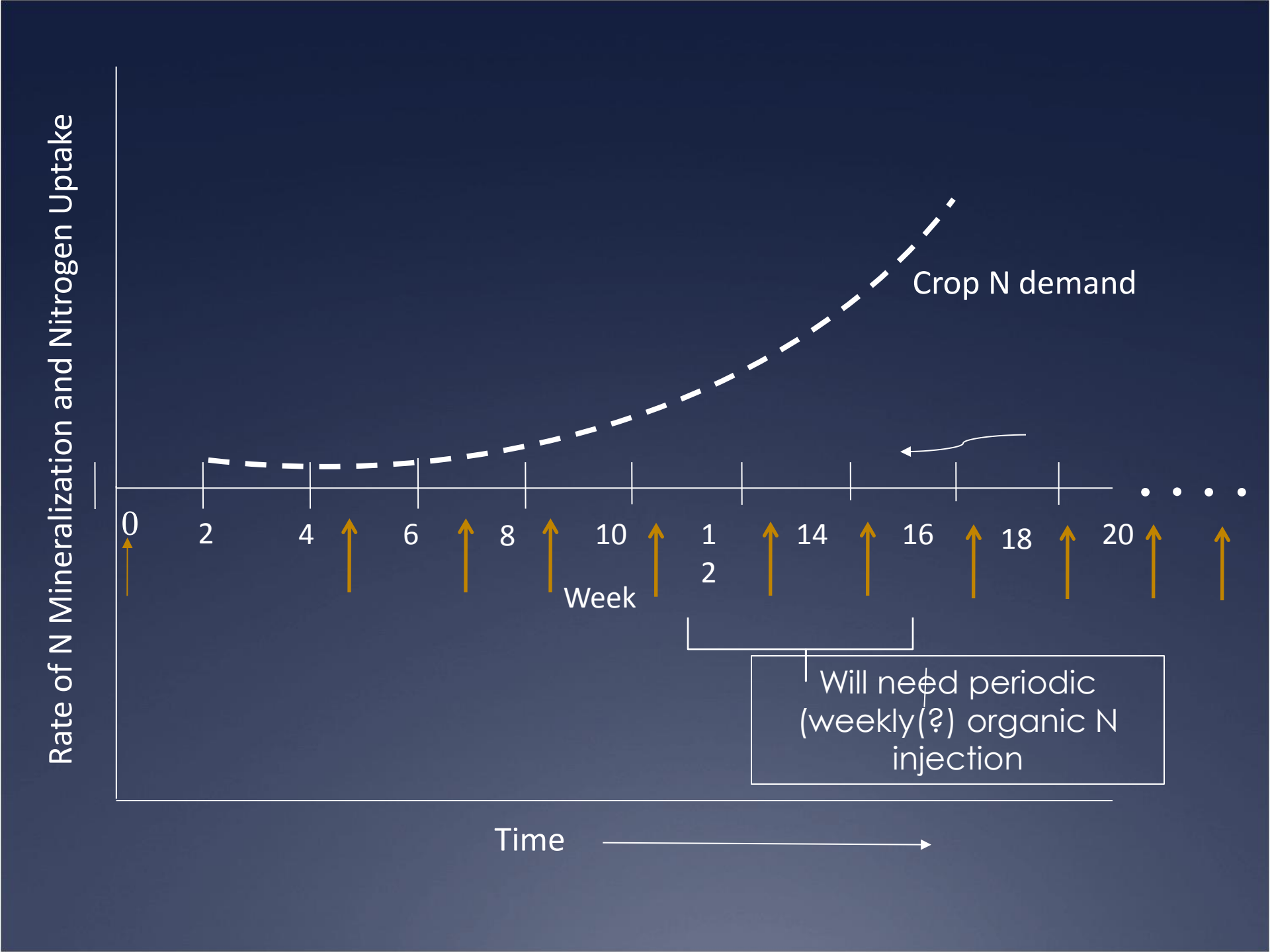
Overview

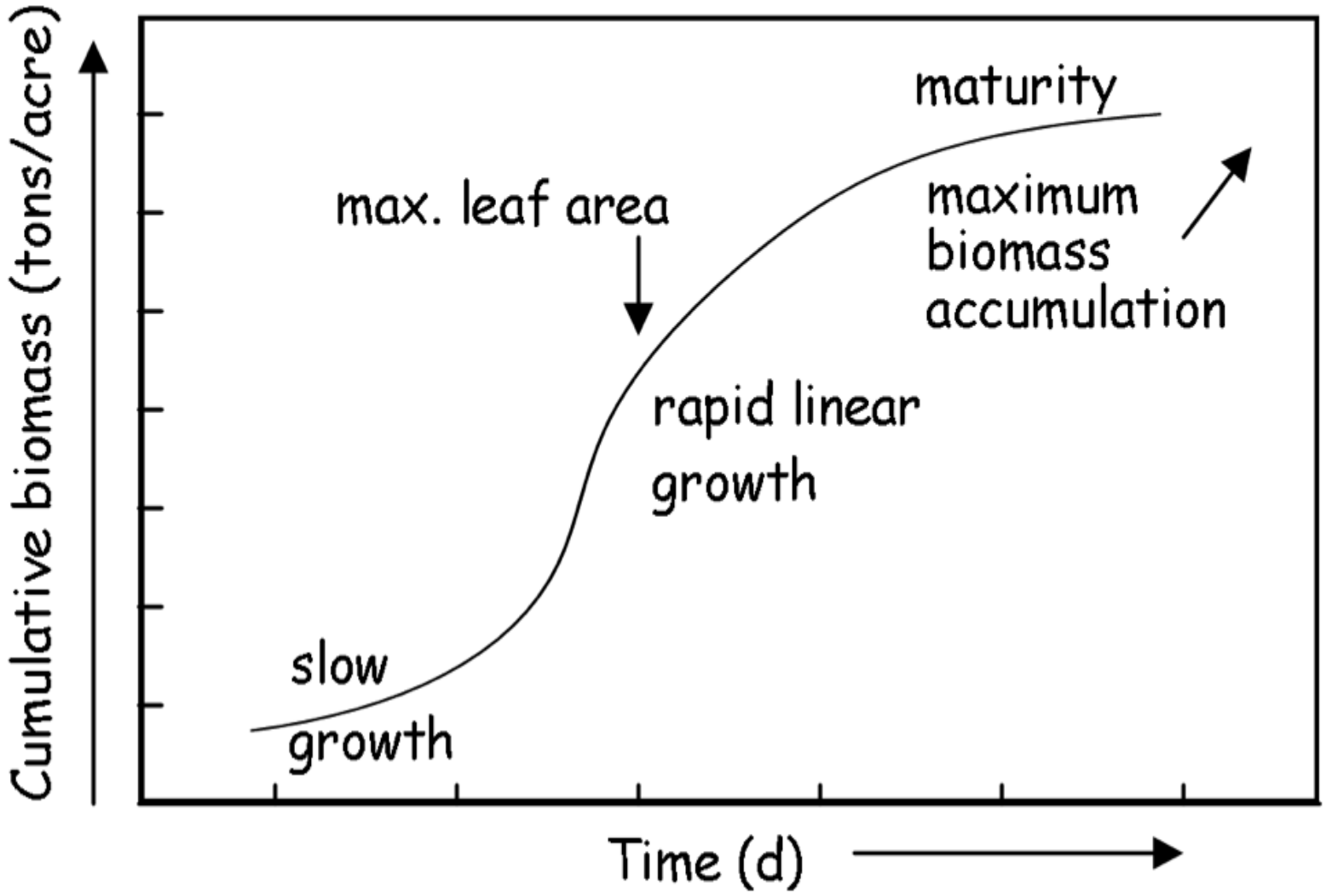
- *Types of materials*
- *Plant N needs*
- *Pattern of N release from organic fertilizers*
- *Costs per lb of N*
- *Fertilization management*

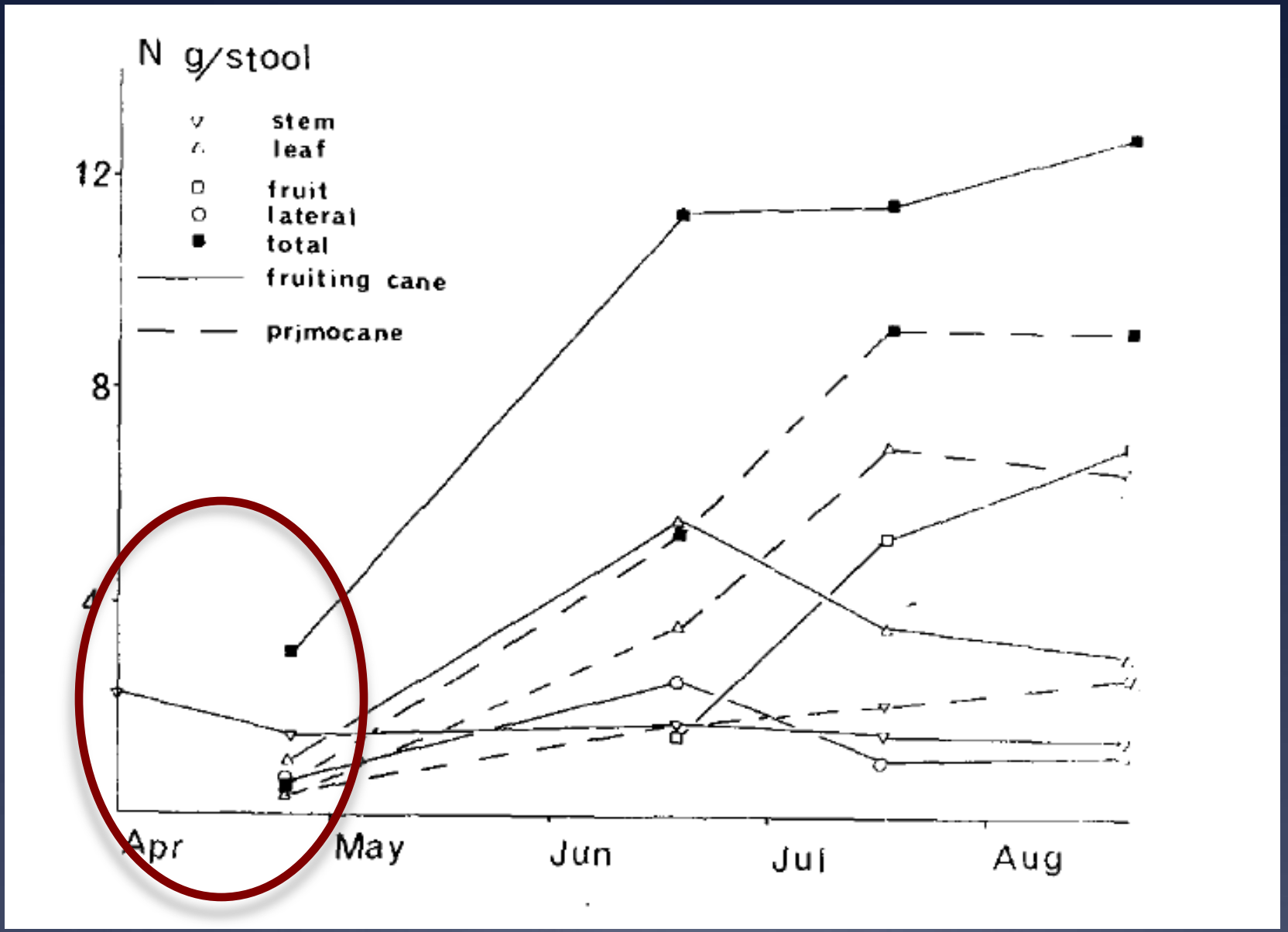
How to determine in-season needs?

- *Plant uptake*
  amount and timing
- *Soil type, % OM ~ < 30 lb N / A / month / 1%*
- *Need mineralization for plant uptake*
  - biological process, variability
- *Commercial organic N fertilizers*
  - dry bulk, + pelleted
  - liquid
- *Many advantages to drip including liquid N materials*


Rate of N Mineralization and Nitrogen Uptake
Pre-plant organic material mineralization
Crop N demand
0
2
4
6
8
10
12
14
16
18
20
Week
Time


Rate of N Mineralization and Nitrogen Uptake
Crop N demand
0
2
4
6
8
10
12
14
16
18
20
Week
Will need periodic (weekly(?) organic N injection
Time


Cumulative biomass (tons/acre)
maturity
max. leaf area
maximum
biomass
accumulation
rapid linear
growth
slow
growth
Time (d)


N g/stool
stem
leaf
fruit
lateral
total
fruiting cane
primocane
12
8
4
Apr
May
Jun
Jul
Aug

Crop	Yield	Max. dry matter accumulation (ton / A)	Maximum N accumulation lb N / acre	Phase II Growth Period	Max. N Uptake lb N / A / day
			275	45	4 - 5
Celery		10-14	200-280	70 – 90 days	5
Strawberry	5500 trays	7	150	140 days	~ 1
Raspberry	3500 trays	7.5	100-120	130 days	~ 1

Not 100% efficient

Also leaching losses and EC mgmt

adapted from Sullivan et. al. , 1999; Hartz, others

Caneberry N needs

- *Mid April – July enter in period of high N demand*
  - *tunnels? -could be Dec or Sept?*
  - *primocanes ankle to knee high*
  - *floricane branches 6-12”*
- *New developing canes and leaves need high N*
- *Thick canes and large leaves >>> large fruit, more fruit*

Name	description	label N %	actual % total N	% N in solution or particulate matter small enough to pass through a media filter	%N possibly lost in filtration in drip system
~~Agrolizer~~	~~fish~~	~~6~~	~~5.1~~	~~4.5~~	~~0.6~~
Biolyzer	grain ferment	2.5	2.6	2.0	0.6
Phytamin 801	guano, fish	6	6.0	5.5	0.5
Phytamin 522	fish	5	5.4	4.8	0.6
Phytamin 434	guano, fish	4	3.5	3.1	0.4
~~Marizyme~~	~~fish~~				~~0.3~~
Mega Green	co				0.3
Phytamin 421	so pl				0.7

2.6 - 6% N

6 - 21 % too large to pass filter

Name	Total N availability at:
Santa Maria Sand	
Biolyzer	
Phytamin 801	
Phytamin 522	
Phytamin 434	
Mega Green	
Phytamin 421	
MEAN	

N availability ???

fertilizers derived from animal waste products (fish waste, guano) averaged released > 70% of initial N content after 1 week of incubation

compared to > 50% for the plant-derived fertilizers. Across fertilizers less than an additional 10% of initial N became available in the remaining 3 weeks of incubation. Incubation temperature had only minor effects on N availability.

N recovery after 4 weeks averaged 55 and 37% from the animal and plant-based fertilizers
VS 38% of the ammonium sulfate.

Conclusions – incubation study:

1) high mineral N content with some products - like adding ammonium fertilizer

2) plant-based fertilzer materials mineralize more slowly than animal waste-based

3) soil temp has suprisingly little effect on mineralization rate, may have a larger effect on how quickly NH_4-N goes to NO_3-N.

4) soils seem to have an effect; the Santa Maria soil was about 10% faster across all fertilizers

Greater losses likely in field situation

Averaged across soils Name	$ / gal (9.5 lb)	$/lb N	15 ° C.		25 ° C	
			$/lb available N 1 week	$/lb available N 4 weeks	$/lb available N 1 week	$/lb available N 4 weeks
Biolyzer	2.00	8.42	22.41	17.33	20.12	14.79
Phytamin 801	3.39	5.95	7.35	6.78	6.70	6.53
Phytamin 522	3.60	7.58	9.66	8.93	8.82	8.80
Phytamin 434	3.45	9.08	12.03	11.34	11.30	11.24
Mega Green	6.00	31.58	54.71	43.30	44.98	41.35
Phytamin 421	2.94	7.74	11.77	10.15	11.11	9.61

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Does not include losses behind filter, drip tape or irrigation DU

Liquid organic N management

- *Materials expensive, uncertain*
- *Soil organic matter? Nitrate in irrigation water?*
- *Generally 3-6 lb N per week during veg. develop,*
- *New developing canes and leaves need high N*
- *Thick canes and large leaves >>> large fruit, more fruit, over longer period*
- *Chilean nitrate is special case*

Management of organic N fertilizers?

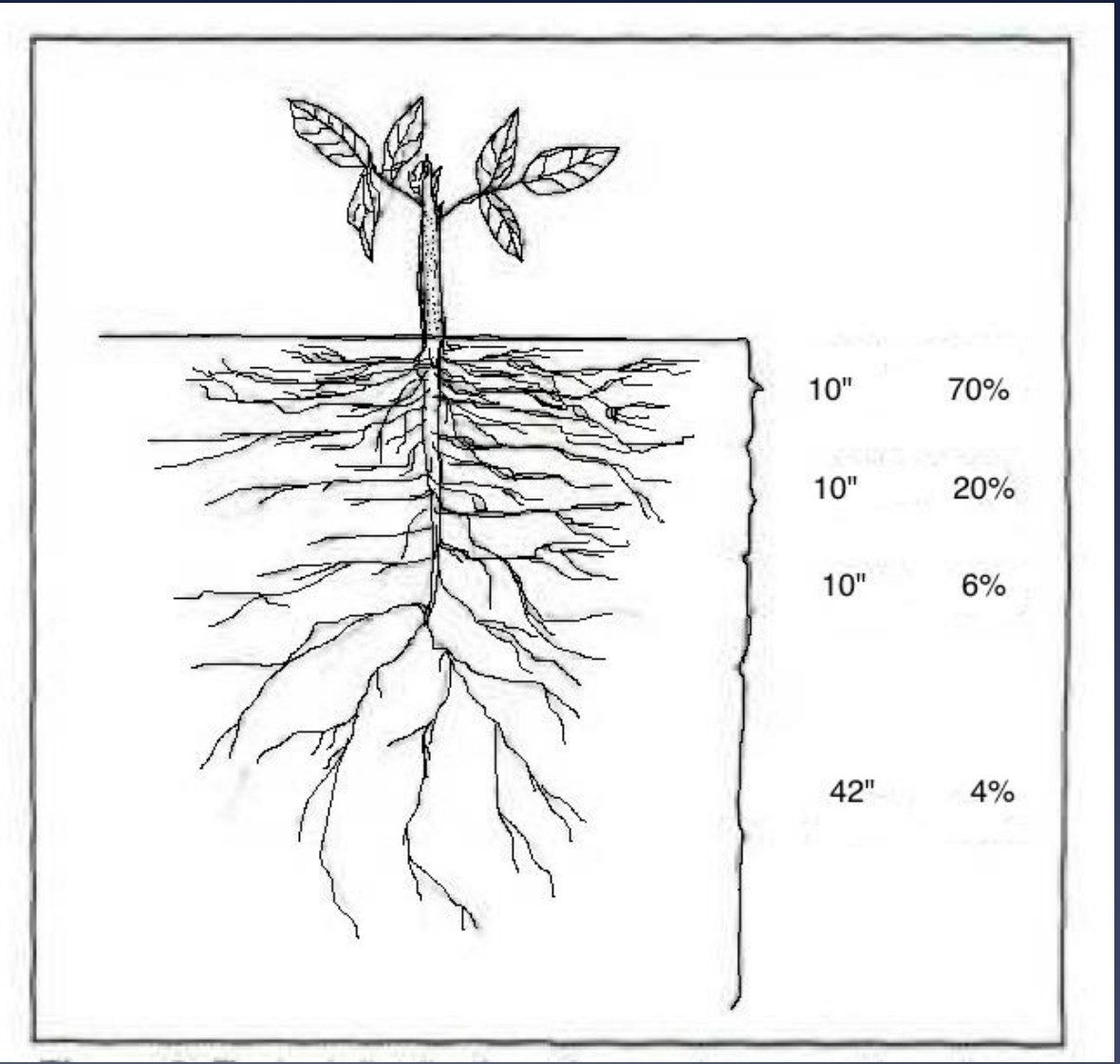
- *new rule in NOP restricts certified liquid organic N materials to 3% UNLESS materials review process (OMRI)*
- *% N tends to fall in stored material*
- *Solid material settles and needs agitation*
- *Some solid remains behind filter and behind drip emitter*
- *Some material remains on soil surface and mineralization is slower.*

Caneberry roots are concentrated in the top 10-20”

N uptake with shallow irrigation

keep surface soil relatively moist (NOT WET!) to avoid stress

Frequent relatively short irrigations to avoid leaching



Summary

- *Diverse organic amendments available as N nutrient sources*
- *Liquid organic fertilizers are variable but can be managed to improve efficiency. Animal sources appear to have more rapid availability than plant sources. Percent of material is ammonium or rapidly converted to ammonium.*
- *Smaller particle sizes necessary for microirrigation should aid N availability.*
- *Need to match application rates and timing to plant uptake*
- *Need to take care with irrigation management to avoid costly N leaching.*