WHAT IS THE POTENTIAL FOR ORGANIC PROCESSING VEGETABLES IN WISCONSIN?

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Global organic food and beverages market is expected to grow from $57.2 billion in 2010 to $104.5 billion in 2015 at an estimated CAGR of 12.8%

Organic fruit and vegetable market worth $63 billion by 2020

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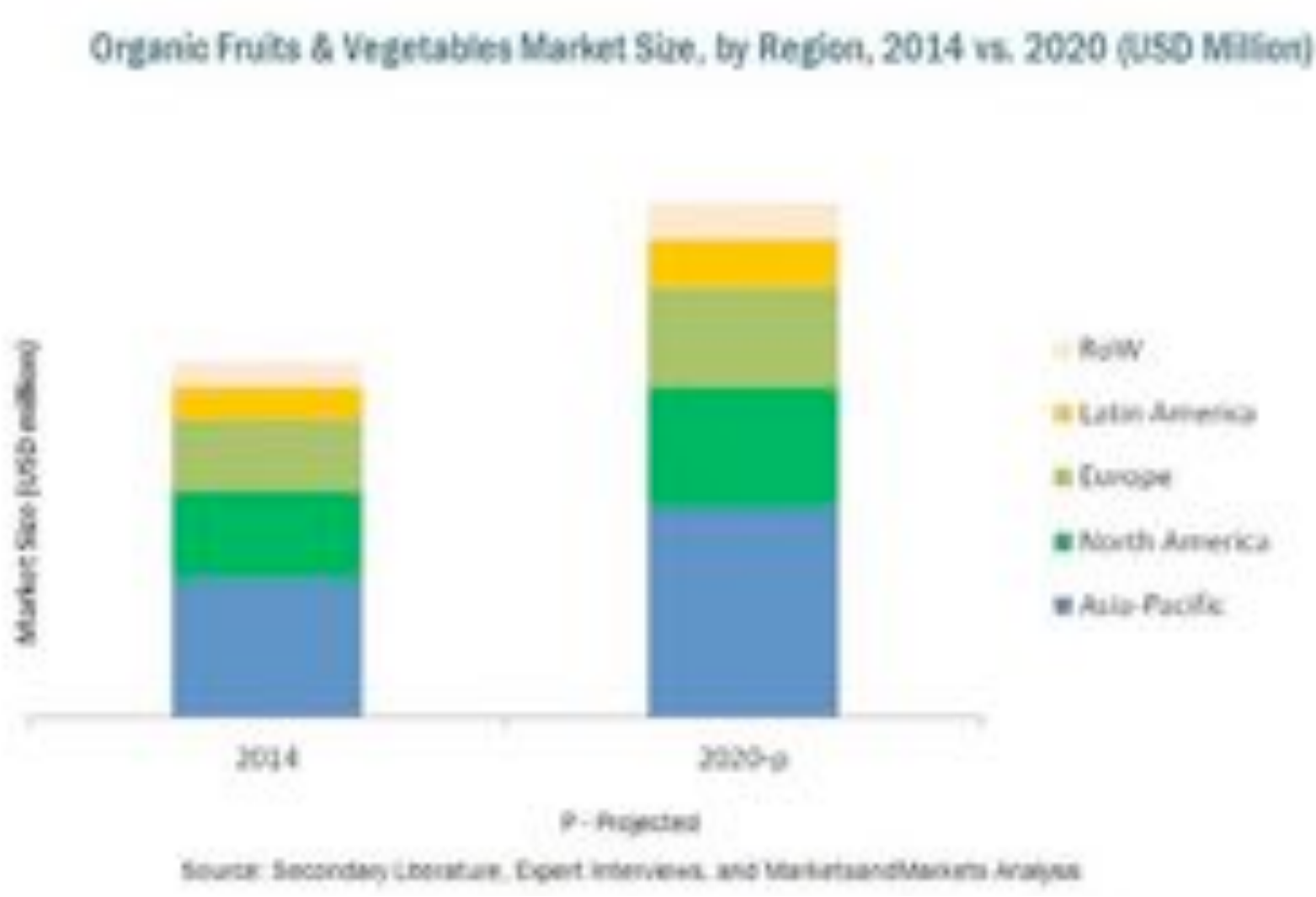
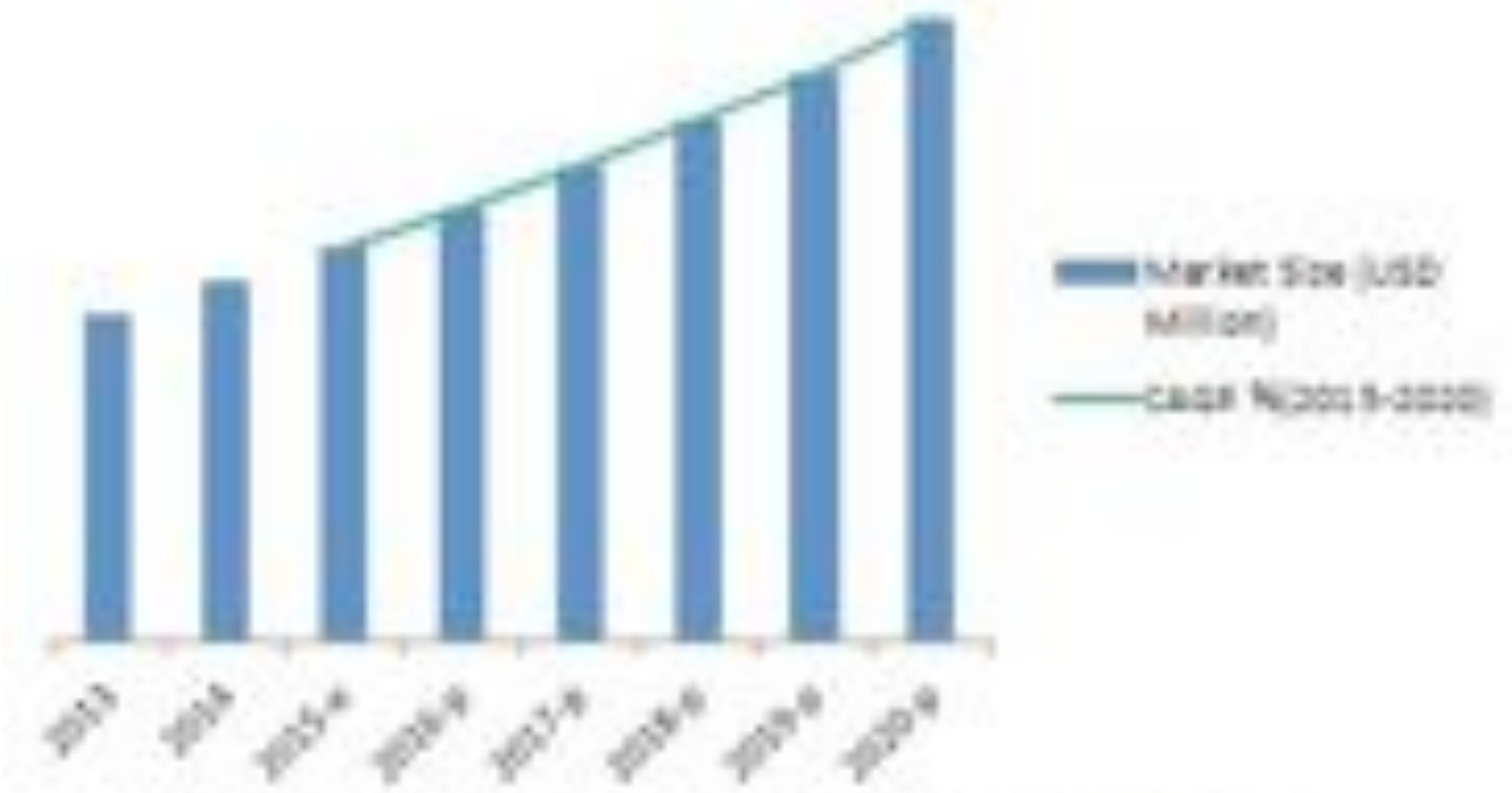
The organic fruit and vegetables market is projected to be worth $62.97 billion by 2020 with a CAGR of 9.4 percent from 2015, according to analysts at MarketsandMarkets.

Relative Market Size by Global Region

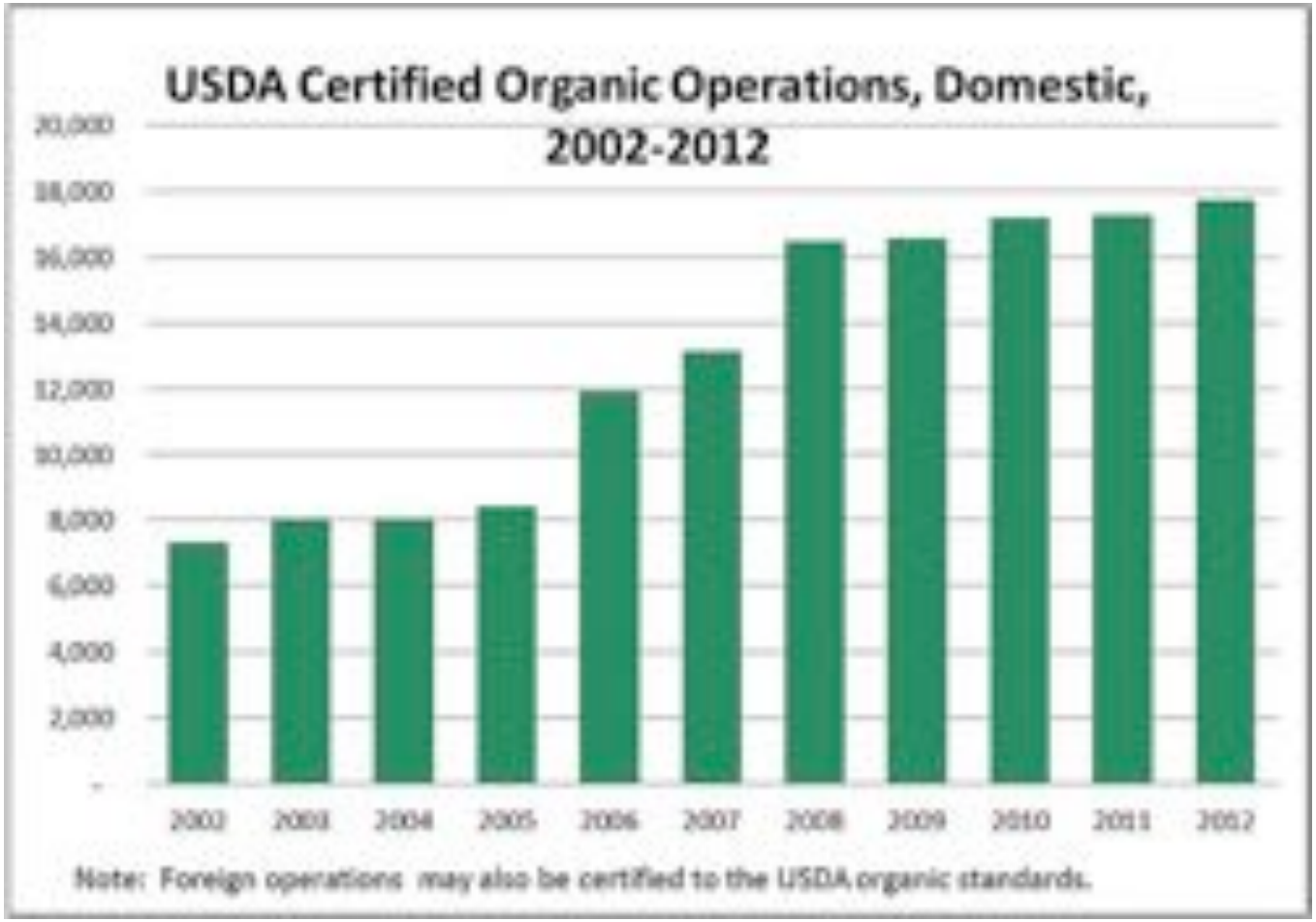


Rate of Growth of Organic Market, 2015-2020



Source: MarketsandMarkets Analysis

Organic acres not keeping pace with growing market demand



Certified Organic Operations in U.S.

National Organic Program

Organic agriculture is "a production system that is managed in accordance Organic Production Standards with the Act and regulations in this part to respond to site-specific conditions by integrating cultural, biological, and mechanical practices that foster cycling of resources, promote ecological balance, and conserve biodiversity."

~USDA ORGANIC DEFINITION

NOP Regulations

- Soil building
- Crop rotation
- National List – naturals allowed, synthetics prohibited
- Compost and manure applications

What is limiting the growth of organic processing vegetables in Wisconsin?

Where are the acres going to come from?

- Existing processing operations converting portion of total acres to organic management
- Existing organic farms (most likely dairy or row crop) designating portion of acreage to processing vegetables

- Challenges to both approaches
  - Economics
  - Production
    - Ensuring stable, predictable, and viable yields
  - Ensuring feed for livestock operations

Major challenges to optimizing and stabilizing organic yields

- Weed management
  - Lack of herbicides
- Stand establishment
  - Lack of seed treatments
  - “sweet” crops
- Fertility management
  - Change of approach

Getting a solid stand

- Bumping up seeding rate
- Choose cultivars that are cold soil tolerant
- Plant in later planting window

Emergence at below 60 F

	% Emergence			Marketable Ears (per 23 feet of row)			Unuseable Ears (per 23 feet of row)		
	2010 WM	2011 WM	2011 Farms	2010 WM	2011 WM	2011 Farms	2010 WM	2011 WM	2011 Farms
Bodacious	47	15	49	20	14	27	5	0	5
Brocade	48	7.5	33	20		18	5		2
Frank's Red	90	45	51	28	23	29	3	1	5
Hookers	93			36			3		
Luscious	29		28	16		23	5		0
Spring Treat	57	23	43	17	14	25	4	0	
Sugar Buns	41	7	24	16	9	16	3	0	2
Temptation	100	57	58	27	26	29	6	1	3
MdseE		36	53		14	24		0	4
MdseL		32	46		14	33		2	2
Fishers Earliest		50	63		19	31		1	3
Top Hat		38	53		21	31		4	7

Organic Weed Management

- Multi-pronged strategy
  - No reliable organic herbicides

- Crop rotation
- Cover cropping
- Establishing canopy cover – shade out the weeds
  - Vigorous early establishment
  - Plant density (seeding rate or row spacing)
  - Plant architecture

Stale Seedbed Preparation

- Weeds are allowed to germinate and then killed with minimal soil disturbance
- First flush of weeds to germinate and are killed as they are just starting to emerge
- Often, two stale seedbed cycles, 5-10 days apart, can be effective, with the second pass used to level the beds just prior to planting
  - Timing of these cycles, though, depends on types of weeds present in the field as well as soil moisture and temperature – try to time the second pass just when the second flush of weeds is emerging and close to cash crop planting

Mechanical Weed Management

- Can manage both in- and between-row weeds
- Must have right tools for the job, and spend the time to set the tools correctly
- Works in tandem with building soil tilth
- Timing very specific to farm environment – tools and management must be available on-farm

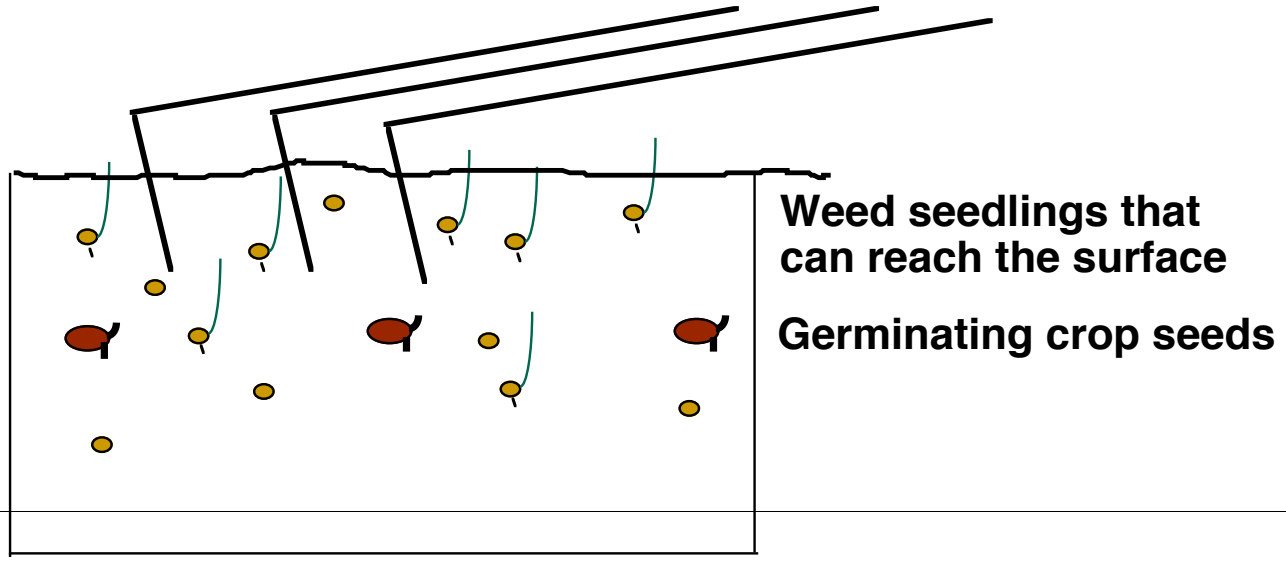
Tine Weeder

Comparison of Tine Weeders

Machine	Arm	"Tooth"	Diam.	Angle	Spacing	Mounting
Kovar	15" 20" 20"	Straight 5" 3.5"	5/16 or 1/4 5/16 or 1/4 1/4	0 45° 80°	~ 1.5"	Chain
Einboch				~ 60 °	1"	Rigid
Rabewerk	10.5"	5"	1/4	45 °	1"	Chain +
Lely	15"	4.5"	3/16	75 °	1.6"	Rigid

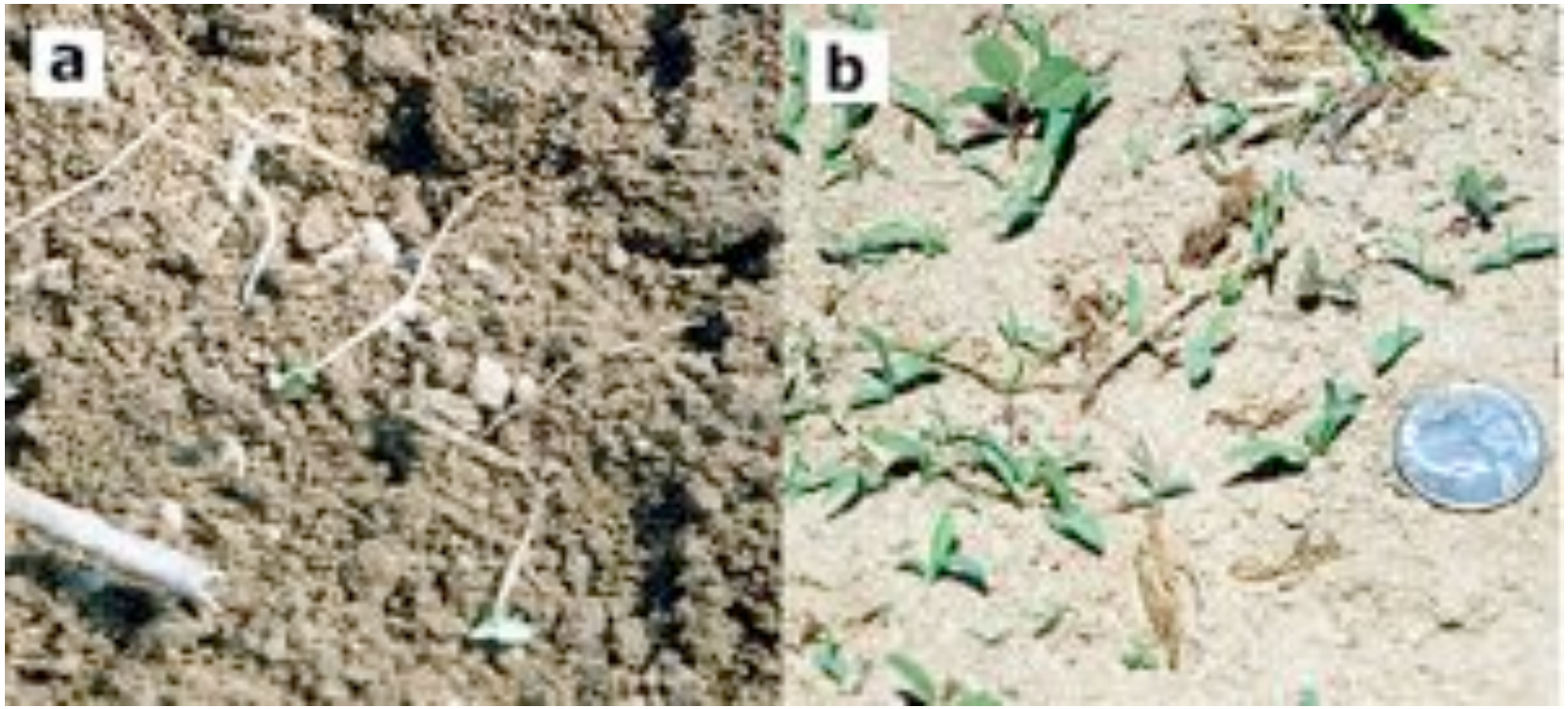
When to Tine Weed

- Corn – pre-emergence to about 8”
  - Avoid acute 60° to 80 ° tines, especially at spike to 2 leaf stage
- Soybean, beans – pre-emergence; seedling to 8”
  - Avoid crook stage!

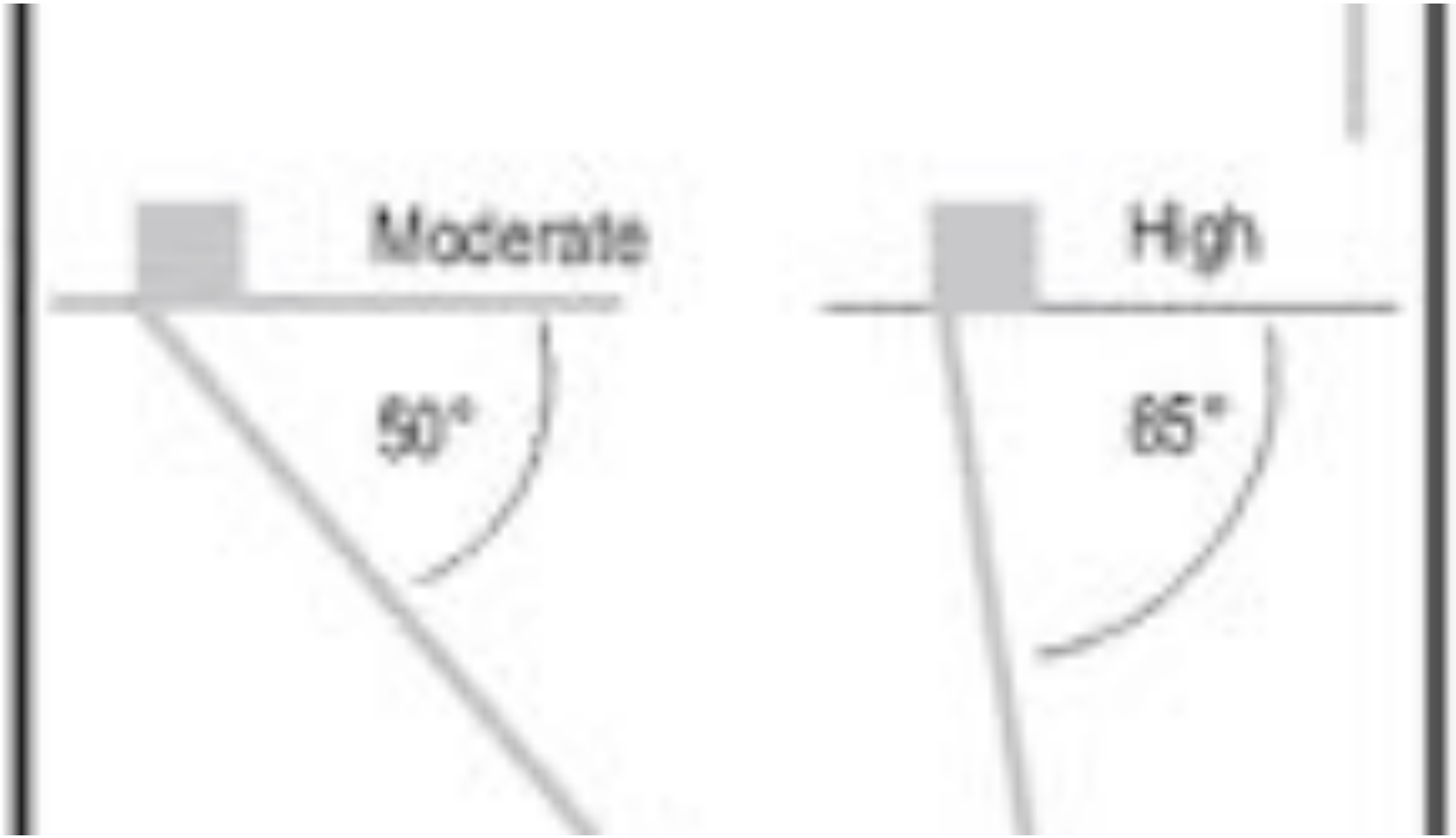


Tine Weeding Video

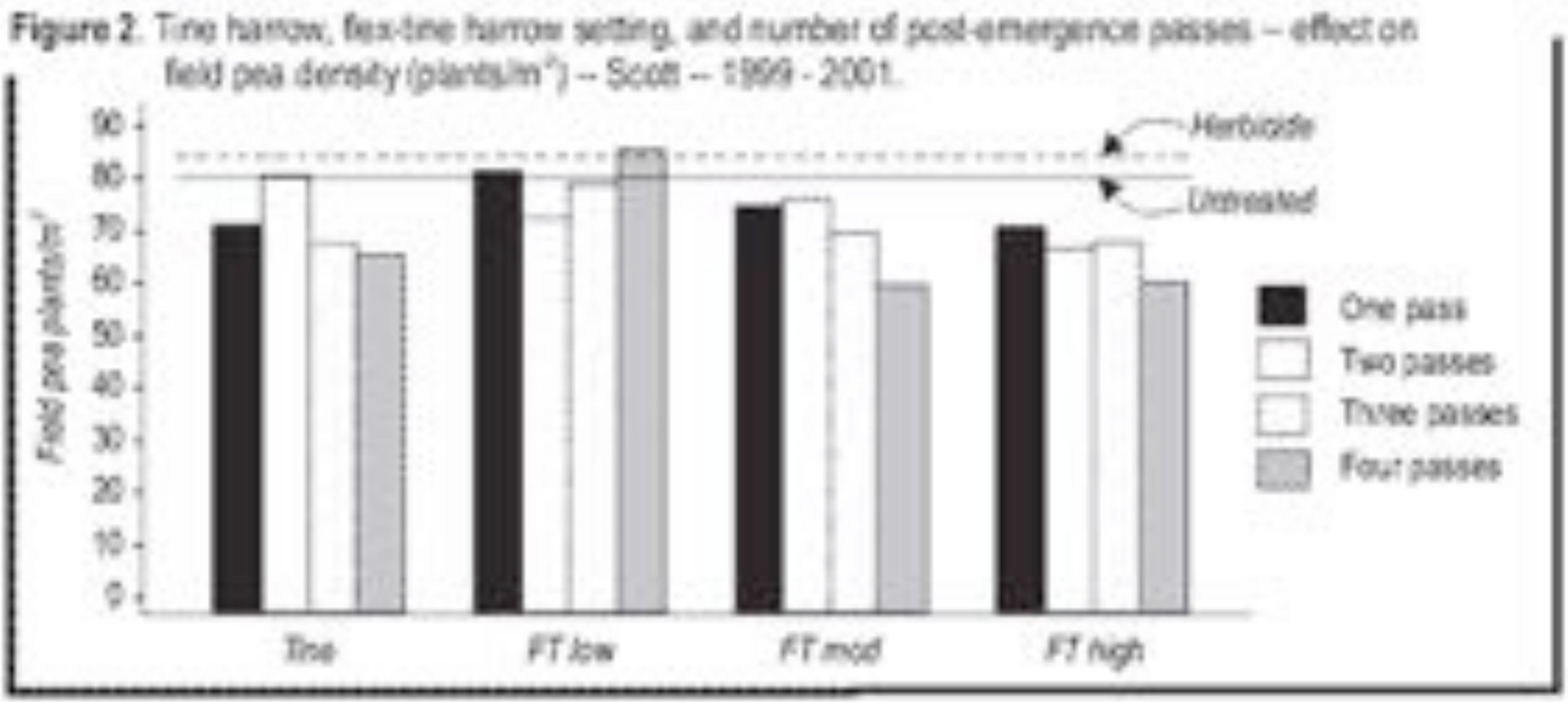
- https://www.youtube.com/watch?v=JcVJlNnhPNY
- Start at 1 min



Tine weeders can vary in aggressiveness



Tine weeding and cultivator blight



Rotary Hoe

Points about Rotary Hoeing

- Crop stages – similar to tine weeders
- Weeds must be tiny – small window of opportunity
- Great for breaking crusts
  - Break crusts with rotary hoe, then tine weed
- High speed – 9 to 12 mph
- Use every 5-7 days, 2-3 weeks after planting
- Best used in afternoon
  - Beans and corn are more flexible due to lower turgor pressure

Row Cultivator

Row Cultivation

- Crop rows planted 30 inches or more apart
- Beans have two to three trifoliate leaves and corn is beyond the two-leaf stage (V2) and 8 to 10 inches tall
- Shallow cultivation at 1 to 2 inches deep will avoid harming crop roots
- Continue to cultivate at 7-to 10-day intervals until the corn is too tall and the crop canopy closes the rows
- Cultivation works best when performed during the heat of the day in bright sunlight

Cover Crops

- Can help compete with weeds, build soil organic matter and fertility
- Winterkilled cover crops
  - Oat, barley, chickling vetch
  - Good for fall planting preceding earlier planted spring crops (peas, early sweet corn)
- Overwintering cover crops
  - Rye, winter wheat
- Legume-based cover crops – potential source of fertility for sweet corn crop

Winter Wheat Vs. Rye

- Winter wheat more slow to start growing in spring, so can give more window in management time
  - Less winter hardy

Clover between harvested bean rows - Fall

Bussan and Schroeder

Crimson Clover

- Strong nitrogen fixing and high biomass potential – N production will be greater if killing occurs after flowering
- Winterkills under cold temperatures, but can overwinter
- Effective weed-suppressing green manure crop
- Needs to be planted at least 4-8 weeks before a killing frost
- Shade tolerant – survives intercropping applications into standing cash crops

Crimson clover

Chickling Vetch

- Can plant anytime you plant oats, frost tolerant, fast growing
- Midsummer planting will winter kill and leave a thick mulch that incorporates easily in the spring

Fertility management in organic vegetables

- NOP-compliant sources
- Consideration of cost and nutrient availability

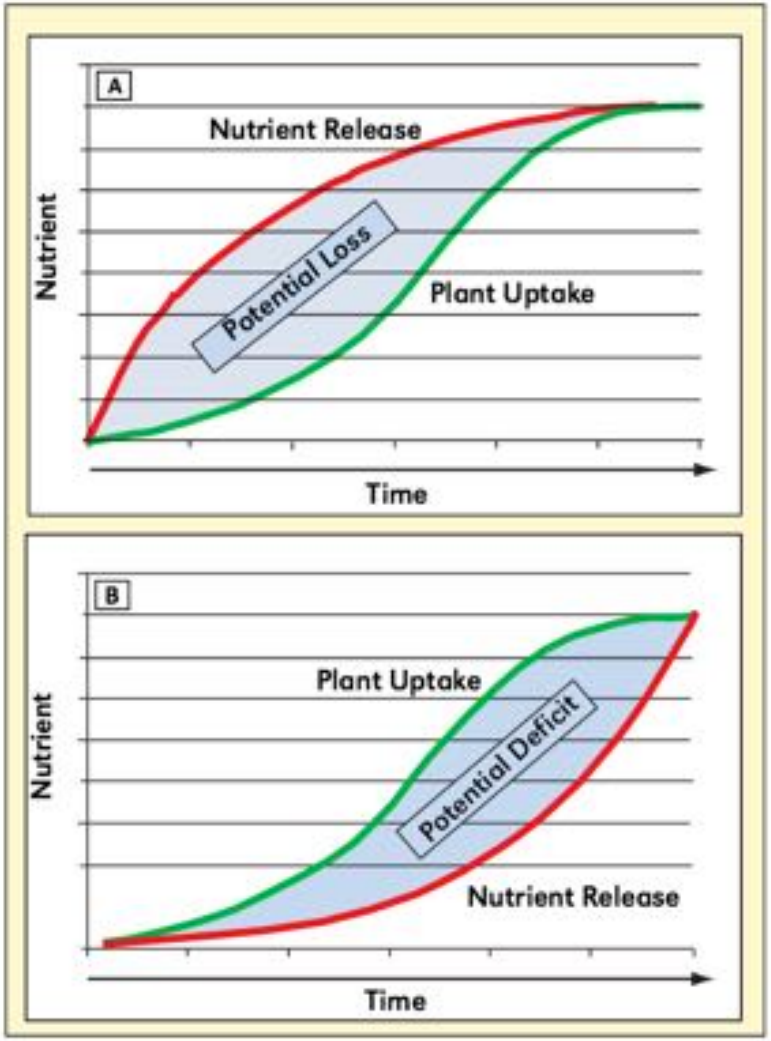


Figure 2. Synchronizing nutrient release with plant demand is a challenge with organic materials. Rapid release from organic sources with a low C:N ratio may supply nutrients more rapidly than the plant's demand (A). An organic material with a high C:N ratio may not release nutrients sufficiently rapid to meet the need of growing plants (B).

Table 3. Average sweet corn processing yield, fresh market yield, and harvest index (HI) with ANOVA results as affected by manure system, weed treatment, and nitrogen (N) rate. Within each column for each statistically significant treatment factors, means followed by the same letter are not significantly different (α=0.1).

	2011			2012		
	Processing yield	**Fresh market yield**	**HI †**	**Processing yield**	**Fresh market yield**	**HI †**
Manure System ‡	Mg ha^{-1}	1000 ears ha^{-1}		Mg ha^{-1}	1000 ears ha^{-1}	
NM	16.5 ab	46.4 a	0.42 a	21.2	58.2	0.75 b
CPM	17.2 a	45.8 a	0.42 a	22.5	60.1	0.80 b
GrM	15.5 b	42.5 b	0.36 b	22.9	61.4	0.91 a
Weed Management §						
MOD	16.0	42.9	0.37 b	21.7	58.6 b	0.87
INT	16.8	46.9	0.42 a	22.7	61.1 a	0.77
N rate ¶, *kg ha*$^{-1}$						
112	14.3 c	41.0 c	0.37 b	21.5	57.5 b	0.86 a
168	16.3 b	45.2 b	0.39 b	22.1	59.9 ab	0.82 ab
224	18.6 a	48.6 a	0.43 a	22.9	61.5 a	0.85 a
280	-	-	-	22.4	60.6 a	0.76 b
Source of variation			***P* value**			
Manure system (S)	0.071	0.067	0.0350	0.135	0.248	0.0181
Weed (W)	0.347	0.175	0.0825	0.113	0.032	0.1048
S × W	0.118	0.028	0.3299	0.105	0.080	0.8429
N rate (N)	<0.001	<0.001	0.0229	0.102	0.098	0.0408
S × N	0.806	0.426	0.3482	0.957	0.968	0.0366
W × N	0.300	0.340	0.5933	0.338	0.075	0.7208
S × W × N	0.651	0.054	0.0482	0.034	0.213	0.8386

† HI = Harvest index; ratio of dry unhusked ear to stalk weight

‡ NM = No Manure, CPM = Composted Poultry Manure, GrM = Green Manure (spring-seeded field pea)

§ MOD = Moderate weed management, INT = Intense weed management

¶ N applied as feather meal (11-0-0), split-applied at approximately the V4 and V8 growth stages

So what can we conclude?

- Tools are available to assist with optimizing and stabilizing organic yields
- Question remains as to what is the most viable approach to sourcing acres