A Preliminary Comparison of Organic, Grafted, and Conventional Cantaloupe Production Under SDI

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Overview

- Introduction to project
- Subsurface drip irrigation (SDI) in the West
- Melon field trials
- Economic results of field trials
- Preliminary results

Introduction

- A potentially profitable niche market strategy is to identify production process that can be executed better than the competition
- Example: melon production
  - Early adopters of grafting and organic production in melons are looking for success in terms of increased quality and cost efficiency over the competition

Subsurface Drip Irrigation

- Subsurface drip irrigation (SDI) offers unparalleled irrigation efficiency
- <u>Cons:</u>
  - – Installation costs are relatively high
  - – Crop rotations limited
    - Need for specialized equipment
    - Need for high value crop (to offset capital investment costs)
- <u>Pros (specifically for melons):</u>
  - – “First fruit” melons can be harvested while irrigation is occurring through drip lines
    - Nourishes melon quality
    - Increases quantity of melons for season
  - – Allows for chemicals to be applied directly to the soil through the drip line
    - Minimizes loss of volatile chemicals to the atmosphere
      - – i.e. Methyl bromide

Conventional Melon Production in West

- Under SDI, conventional melon production has applied methyl bromide to control:
    - Soil-borne pests
    - Fungal diseases
    - Certain weeds
- Ex. Root knot nematodes
    - Microscopic parasites that feed on plant roots
    - Disrupt the flow of water and nutrients to the plant
    - Melon plants infested with root knot nematodes are less healthy, develop a shallow root system
    - *Meloidogyne incognita* is the most common nematode of economic importance to melon producers in the West
- Methyl bromide depletes the stratospheric ozone layer
    - Being phased out
    - Critical use exemptions are required to use it as agreed to by the Montreal Protocol and the Clean Air Act

Melon Grafting

- One result of methyl bromide phaseout is increased attention on melon grafting
  - Melons can be grafted to certain squash, other cucurbit rootstock
  - Grafted melons may be more resistant to fungal diseases, soil-borne pests
  - Can eliminate need for synthetic pesticides
    - So melons can be grown organically
- Grafting of young vegetable seedlings done in Asia for many years
  - Development of “tube grafting” in the early 1990s made grafting suitable for commercial propagators
    - Also, use of semi-robot and robotic equipment has increased feasibility of grafting vegetables on a large scale

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Grafted Melons

Field Trials

- Field experiments were conducted in Arizona in fall 2007
- For each grafting trial, both conventional and organic practices were used:
    1. Direct seeding of Olympic Gold (transplanted July 16)
    2. Olympic Gold grafted on Tetsukabuto (transplanted July 20)
    3. Acclaim grafted on StrongTosa, an interspecific hybrid squash (transplanted July 28)
    4. Transplants of non-grafted Olympic Gold (transplanted July 26)
- Ideally, all trials would be planted on the same day
    - Difficulties with shipment orders did not allow for this
- Four replications of each trial were completed

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Transplanting

- Most transplanting done by hand, due to issues with the transplanting machine
- Plastic cover placed over top of drip line
  - The plastic serves multiple purposes in production
    - Helps to retain volatile chemicals in the soil that are applied through the drip system
    - Helps to provide weed control and moisture retention in planting bed for seedlings
  - A white wash was placed on the plastic for fall melons
    - Soil beneath the plastic stays cooler than the bare ground
    - Black plastic is used in the spring to retain heat and warm the soil
  - A whole was burned into the plastic by the planting machine for the direct seeded melons

Manually Planting the Grafted Transplants

Transplanting Issues

- Transplanting requires much more labor than direct seeding
- Organic production for this trial was only viable because the operation was able to shift all labor over from the conventional side
- Complementary aspect of labor supply from producing both conventional and organic melons at the same time
  - Beneficial to have a large labor pool available to address production issues that may arise with organic production
    - Transplanting
    - Weed control
    - Pest control actions

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Weeds and Pests

- Yields may not be adversely impacted from root knot nematode *Meloidogyne incognita*,
  - However, fruit quality is believed to suffer in the form of lower sugar levels or brix percentages
- Weeds and nematodes are generally not as much of an issue using virgin land or coming off certain crop rotations
  - But rotational crops that are good for weed and pest control may not be marketable or fit into the production system
  - Example: alfalfa could serve as a rotation crop with melons
    - But is a relatively bulky commodity
      - Cannot be shipped too far and still be cost competitive
    - Also, alfalfa is not very amenable to growing on beds with SDI

Grass and Weeds in Organic Section

Field Tests

- Cantaloupes were harvested from 33-foot samples on each melon bed
  - Between Sept. 22-Oct. 5
- Sizes ranged from size 6 to size 18
  - Normalized on size 12, using relative wholesale prices from San Joaquin Valley, Arizona, and Chicago market prices
    - Ex. Price of size 6 melons was 4% greater during this time per half-crate than size 12 melons
      - So the production of size 6 melons was weighted by 4% more than size 12s

Size Distribution for Field Tests

- Size 12 was considered the baseline
- Most common size harvested, essentially the “middle” size

Production Method & Variety	Size 6	Size 9J	Size 9	Size 12	Size 15	Size 18	Decay
Conventional							
Direct seeded Olympic Gold (baseline)	0.0%	6.4%	32.7%	22.2%	16.1%	17.8%	4.8%
Olympic Gold grafted on Tetsukabuto	0.2%	13.6%	31.3%	19.6%	13.8%	18.2%	3.2%
Acclaim grafted on StrongTosa	0.0%	5.0%	26.4%	21.9%	24.3%	20.6%	1.8%
Non-grafted transplants of Olympic Gold	0.0%	2.2%	12.4%	20.3%	23.5%	41.6%	0.0%
Organic							
Direct seeded Olympic Gold	0.0%	12.9%	30.2%	21.9%	14.2%	15.1%	5.6%
Olympic Gold grafted on Tetsukabuto	0.3%	9.3%	28.0%	23.7%	16.3%	15.2%	7.2%
Acclaim grafted on StrongTosa	0.0%	11.9%	35.9%	21.8%	13.9%	8.8%	7.7%
Non-grafted transplants of Olympic Gold	0.0%	2.7%	22.8%	30.8%	19.7%	21.1%	2.9%

Economic Results

- Yield, cost, and break-even price were determined for each trial
- Results presented in relative terms using the baseline of direct seeded Olympic Gold
  - So comparisons can be made across melon types
  - Also to protect confidentiality of operation

Economic Results

Production Method & Variety	Relative Yield	Relative Production Cost	Relative Break-Even Price
Conventional			
Direct seeded Olympic Gold (baseline)	100%	100%	100%
Olympic Gold grafted on Tetsukabuto	85.4%	332.9%	390.1%
Acclaim grafted on StrongTosa	76.3%	332.9%	436.2%
Non-grafted transplants of Olympic Gold	79.6%	167.1%	210.0%
Organic			
Direct seeded Olympic Gold	105.8%	116.4%	110.1%
Olympic Gold grafted on Tetsukabuto	124.6%	349.4%	280.3%
Acclaim grafted on StrongTosa	86.3%	349.4%	404.8%
Non-grafted transplants of Olympic Gold	89.0%	183.5%	206.3%

- It should be noted that non-grafted Olympic Gold and Acclaim were transplanted 8 days after the others
  - Both had lower yields; may suggest weather conditions were less favorable
  - Results should be treated as preliminary

Conclusions

- Identifying a successful niche market is often linked to identifying a production niche
- Quality standards in size, firmness, and brix must always be met and monitored for both conventional and organic methods
- Anticipating price premiums is a key factor in determining whether organic production should be pursued
  - Organic versus conventional melons
  - During different production windows
- Organic acreage is generally small relative to conventional acreage
  - Allowed this operation to shift almost all their labor to the organic fields when organic production challenges arise
    - Seeding transplants by hand, hand weeding, pest control, etc.

Conclusions

- This operation either forward contracts or locks in prices on around 60% of their expected production
  - Prices are generally set on a slide so that
    - If market prices drop during harvest they don't absorb the full decline
    - If market prices increase, they don't receive the full benefit
- This operation has received some nice premiums for organic melons in the past
  - Have also sold many organic melons at conventional prices in order to move sufficient volume when the fruit is ripe
- A key production concern regarding organics for this operation is the ability for insect pests and diseases to quickly spread from small acres of organics to the larger commercial operation
  - The predominant acreage of conventional melons on this operation could be put in jeopardy from a relatively small amount of organic acreage
    - Because insect pests like whitefly will readily move from organic to conventional fields

Thank you!