Maine Wild Blueberry Systems Analysis

Wild Blueberries – world wide
Wild production concentrated in Maine, Atlantic Canada and Quebec

systems analysis: mathematical & stat analysis

ecological interactions

mix of production practices

inputs outputs externalities

insect pests weeds pathogens bees predators

economics

quality, taste

cultural & pesticide

new control strategies

grower input
## Methods - Systems input criteria

<table>
<thead>
<tr>
<th>Production Factors</th>
<th>Organic</th>
<th>Low Input</th>
<th>Medium Input</th>
<th>High Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pruning</td>
<td>Burned</td>
<td>Burned</td>
<td>Mowed</td>
<td>Mowed</td>
</tr>
<tr>
<td>Land leveling</td>
<td>Not land leveled</td>
<td>Not land leveled</td>
<td>Land leveled</td>
<td>Land leveled</td>
</tr>
<tr>
<td>pH management</td>
<td>pH managed</td>
<td>No pH management</td>
<td>pH managed</td>
<td>pH managed</td>
</tr>
<tr>
<td>Fertility</td>
<td>No fertilizer</td>
<td>Some fertilizer</td>
<td>Fertility (both cycles)</td>
<td>Fertility rate much higher</td>
</tr>
<tr>
<td>Pest, disease, and weed control</td>
<td>Cutting woody weeds, grazing with goats, no pesticides used</td>
<td>Herbicides, insecticides, some sites with fungicides</td>
<td>Scouting, herbicides, insecticides, fungicides in crop year</td>
<td>Scouting, herbicides, insecticides, fungicides in both years</td>
</tr>
<tr>
<td>Treatment of bare spots</td>
<td>Mulch</td>
<td>No mulch</td>
<td>No mulch</td>
<td>Mulch</td>
</tr>
<tr>
<td>Irrigation</td>
<td>No irrigation</td>
<td>No irrigation</td>
<td>No irrigation</td>
<td>Irrigation as needed</td>
</tr>
<tr>
<td>Pollination</td>
<td>Bees 0 to 2 hives/acre</td>
<td>Bees 1-3 hives/acre</td>
<td>Bees 2 hives/acre</td>
<td>Bees 5-7 hives/acre</td>
</tr>
<tr>
<td>Harvest method</td>
<td>Hand raked</td>
<td>Hand raked</td>
<td>Mechanical Harvest</td>
<td>Mechanical Harvest</td>
</tr>
</tbody>
</table>

**Organic**

**Low Input**

**Medium Input**

**SCRI 8 to 16 Fields**
Methods

Structural equation modeling was used to produce a “path analysis” of the dynamics. AMOS software was used to estimate the beta coefficients for each of the relationships in our *apriori* hypothesized relationships among stated variables. Initial hypothesized models were based upon our expert opinions and previous observations. Relationships are described by standardized Beta or correlation coefficients with the following symbols: †, *, **, and *** representing P value intervals of:

- ≤ 0.10, ≤ 0.05, ≤ 0.01, ≤ 0.001

SCRI Sites 2014-2015

- High
- Low
- Medium
- Organic
Results

Input Systems Study - yield values by system for all years

Year $\theta^2 = 21.81$
System $\theta^2 = 43.25$
Site $\theta^2 = 34.94$

Results

Average Yield by System over Three Crop Cycles

Per acre average kg/ha

Organic Low Medium High
Yield and Profitability from Systems Study
Conclusion

System management accounted for the greatest variation followed by site and year

Yield for High vs Medium and Low vs Organic system not significantly different but the two groups were significantly different

Key negative factors

Burning for pruning reduced plant stand and yield and Frost major limiting factor to yield

Burning and insecticides decreased beneficial insects but insecticides reduced yield losses and P and B increased tip midge

Mummy berry and leaf diseases reduced yield, and bees increased mummy berry

Higher levels of management increased disease and required more fungicides

Al increased stem density and mummy berry
Conclusion

Key positive factors

Number of buds per stem and fruit set were consistently correlated with higher yield

Higher inputs of pollinators major factor in improving yield

Improving plant health with fertilizer and lowering soil pH with sulfur and along with higher organic matter improved yield and leaf B reduced leaf spot

Protecting losses from weeds, insects and disease improved yield

Yield and Profitability

While the organic input production system had low yields, the higher value of the organic fruit and the fresh sales and value added products produced the greatest overall average profit on small scale farms

The medium input system produced the next highest profit a while the high input system was third in profitability

The risk simulation indicated that overall all systems could be profitable but the higher inputs resulted in reduced risk of not being profitable.
**Crop Estimate**

The blueberry plants in Maine had long warm fall and warm wither with a early spring without much frost in the ground

Exceptionally strong bloom and good pollination weather state-wide

We did observe some frost injury in some fields plants but warm then cold temperatures resulted in injury to low spots in many fields

We had very few infection periods for mummyberry disease with the dry weather so most growers were able to protect with just one fungicide application

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**Crop Climate**

No month had adequate rain fall  August had several well spaced rain events that saved crop

Mostly cool Temperatures ( hot Late August )

Cool temperatures and less than adequate moisture resulted in maintaining good quality but smaller berries on many fields

Harvest continued into second week of September Downeast
Monitoring for pests - Maggot Fly and Spotted Wing Drosophila

BMF less of an issue with dry soil but still see captures last year had a lot detected in fruit
SWD captures continue to be later and fewer than in past years

Extension - Maine

Maine Wild Blueberry Production and Hives 1985-2013

Millions of pounds or thousands of hives

Number of hives

58,800 hives
used in Maine in 2016
(down from 77,000 in 2015)
Maine wild blueberry production trend

Yields at 100 million pounds last two years and more constant yields
Crop estimate for Maine 100 million pounds

Questions???