# Contemporary Tools for the IPM Tool Box

## Multi-criteria decision making and mind mapping software

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## *Multi-criteria Decision Making*

### Analytic Hierarchy Processing (AHP)

- Weigh and resolve seemingly conflicting criteria to achieve specified goal
- Pairwise comparisons of multiple criteria in conjunction with ratio scale
- Steps for Evaluation:
  - Define objective
  - Structure elements into criteria, sub-criteria
  - Make pairwise comparisons
  - Set up *n* x *n* matrices
  - Calculate weighted sums, Consistency ratio
  - Evaluate alternatives according to weights

### Application for Weed Management

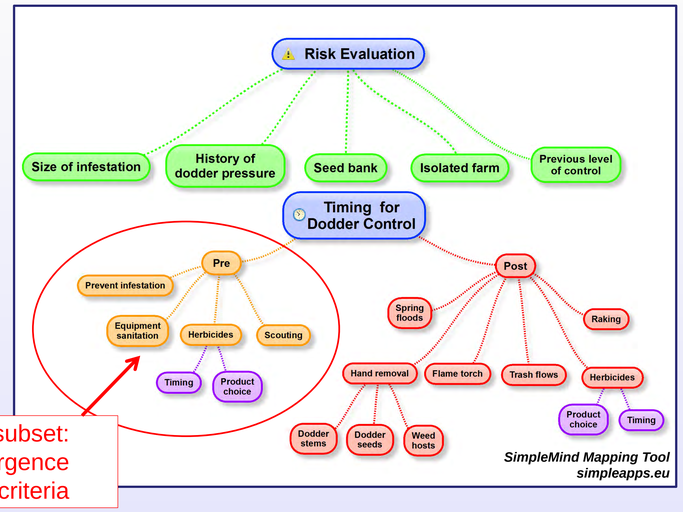
- Resolve potentially divergent IPM objectives:
  - Control options
  - Environmental concerns
  - Economic pressures
- Prioritize strategic alternatives by incorporating qualitative and quantitative data
  - Decision maker's preferences and experiences
  - Economic or other factors

**Objective: Design tailored programs for cranberry growers to manage dodder**

- Management is not straightforward
- No single tactic is effective
- Many options: farm / year / manager

## *Use Mind Mapping to Define Criteria*

- Graphical representation of factors affecting decision - making for dodder control.
- Organizes ideas; ID appropriate pairwise comparisons.




Select subset: Preemergence control criteria

## *Surveys*

**Measure relative importance between each pairwise comparison**

WE USE MANY STRATEGIES FOR **PREEMERGENCE** DODDER CONTROL.
FOR EACH PAIR BELOW, WHICH ONE IS MORE IMPORTANT TO YOU?

| | EXTREME | VERY STRONG | STRONG | MODERATE | EQUAL | MODERATE | STRONG | VERY STRONG | EXTREME | |
|---|---|---|---|---|---|---|---|---|---|---|
| USE HERBICIDES | | X | | | | | | | | PREVENT INFESTATION |
| USE HERBICIDES | | | X | | | | | | | SANITIZE EQUIPMENT |
| USE HERBICIDES | | | | X | | | | | | SCOUT |
| PREVENT INFESTATION | | | | | | X | | | | SANITIZE EQUIPMENT |
| PREVENT INFESTATION | | | | | | | X | | | SCOUT |
| SANITIZE EQUIPMENT | | | | | | | X | | | SCOUT |

9 7 5 3 1 1/3 1/5 1/7 1/9

### Fill in Criteria Comparison Matrix

Herbicides 5x more impt than Sanitizing, thus in Sanitize row, value is 0.20.

| Item Description | Herbicides | Prevent infestation | Sanitize equipment | Scout |
|---|---|---|---|---|
| Use herbicides | 1.00 | 7.00 | 5.00 | 3.00 |
| Prevent infestation | 0.14 | 1.00 | 0.33 | 0.20 |
| Sanitize equipment | 0.20 | 3.00 | 1.00 | 0.25 |
| Scout | 0.33 | 5.00 | 4.00 | 1.00 |

Matrix algebra (spreadsheets) generates ranking of priorities.

## *Promoting Adoption of AHP for Dodder Management*

### Engage Early Adopters

- Demonstrate utility of AHP from other examples.
- Verify key indicators are accurate.
- Provide individual prioritized plans for dodder management.
- Work one – on – one to resolve issues and gauge implementation and effectiveness.
- Re-convene early adopters to share experiences and adjust key indicators if needed.

### Fine – Tune the Process

- Evaluate other criteria groupings in a similar fashion.
- Evaluate each criteria with respect to broader concepts:

Maximize IPM strategies, Lower risk factors, Minimize time on-farm

IN TERMS OF **HERBICIDE USE**,
WHICH IS MORE IMPORTANT?

| | EXTREME | VERY STRONG | STRONG | MODERATE | EQUAL | MODERATE | STRONG | VERY STRONG | EXTREME | |
|---|---|---|---|---|---|---|---|---|---|---|
| IPM STRATEGIES | | | | | | | | | | LOWER RISKS |
| IPM STRATEGIES | | | | | | | | | | MINIMIZE TIME |
| LOWER RISKS | | | | | | | | | | MINIMIZE TIME |

### Next Steps

- Do composite as well as individual assessments.
- Develop user – friendly interface (e.g., radio buttons) to allow growers to determine best IPM program each year.
- Correlate AHP plans with actual success in the field.
- Extend AHP to other IPM models.

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