Integrated Pest Management Decision-Making Utility

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Our Integrated Pest Management framework delivers **four main advantages.** The utility:

1. Makes planning/management assumptions explicit.
2. Facilitates transparent, detailed budgeting.
3. Provides designed, measured responses to infestations rather than crisis responses.
4. Places scientific & technical information into a working context.

Advantage # 1: Our IPM tool makes planning/management assumptions explicit.

1. **Assessment**: For assessing infestation urgency, our model uses indexing to codifiy assumptions on importance of data types from monitoring. It uses a weighted index to collapse urgency into a value between 1 and 10.

2. **Responses**: Our model links an urgency index to multiple-tactic responses fed from a large library of cost models for labor time & motion and biological/chemical controls.

Advantage # 2: Our IPM tool facilitates transparent, detailed budgeting, including management (treatment) costs, as well as projected losses from pest damage.

1. Labor: Our framework includes a large libreary of T&M models for each control tactic. It integrates dozens of variables.

2. Materials: We have built cost models for biological & chemical controls, including extent of use, price, etc. linked to each treatment.

3. Expected Losses: Damage losses track closely with pest population dynamics, so our utility models those dynamics, dependent on key environmental variables.

Advantage # 3: Our IPM tool substitutes designed, measured response for crisis response.

1. Our framework provides a rational, measured, carefully-chosen response in place of an emotionally-driven, hasty crisis reaction.

2. The utility links management responses (controls) to Expected Costs & Values. (That's half the risk-analysis equation!)

Advantage # 4: Our IPM tool places scientific & technical information into a working context

Co-efficients and relationships: Based on published technical and scientific research, our framework represents relationships as co-efficients, for example how many predatory organisms of a certain species to apply to a problem of given magnitude.

Key IPM Assumptions

1. **Primum non nocere**. First do no harm.

In agro-ecosystem management, "first do no harm" translates into the *Precautionary Principle*, which stipulates that the burdon of proof falls upon the producer to prove that treatment effects will cause no harm.

2. **Ya can't do just one thing.** Treatment effects extend through time and space (generally with inverse strength).

Because "you can't do just one thing," the effects of a treatment can be complex, numerous, elusive & long-lasting.

3. **Surprise** and **Error** combine to play a prominent role in all agro-ecosystems.

Science does not offer certainty, by its very structure. But, we can gauge and remain aware of expected surprise, and we can usually choose our error. Scientific methodology and the Precautionary Principle prefer to err towards a false negative (type II error) – rather than a false positive (type II error). Thus, we would prefer to err towards safety of a product. "We thought it was NOT safe, but it was safe" is a much better mistake than "We thought it was safe and it was NOT safe."

However, safely within the Precautionary Principle – and within the constraints of Return on Investment (ROI) – integrated pest management prefers a false positive. In other words, we prefer to over-apply than to ignore or underestimate an infection or infestation, GIVEN that we are clearly not harming the environment nor society AND GIVEN that we expect marginal benefits to exceed marginal costs.

4. Management activities should show a **positive Return On Investment (ROI)**, short-term and long-term.

Demonstrating cost and benefit in a cost-benefit analysis requires assigning expected value to a crop or a portion of a crop, which in turn requires a cost-model. Furthermore, in agriculture, gaining an ROI involves risk taking. At large production scales, risk-taking involves risk analysis, whether formally or informally. Sometimes the spread is obvious.

Sometimes not. (On a technical note, remember that formal risk equals probability multiplied by value). The ability to project costs and assign expected value is key to risk analysis and management.