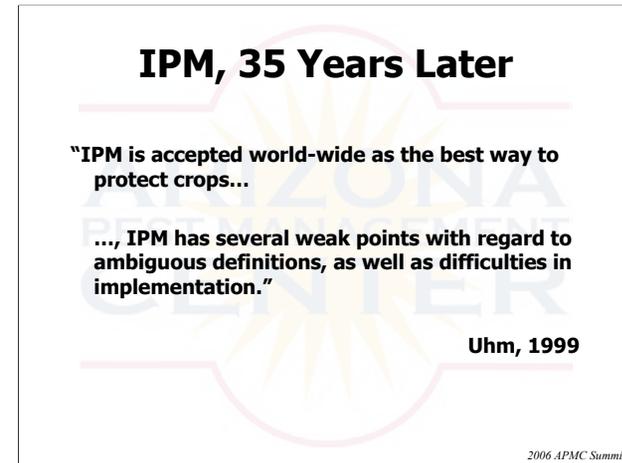


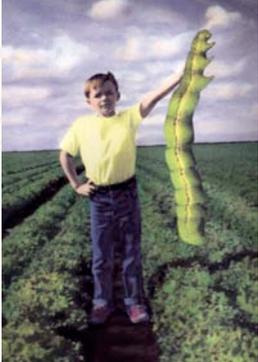
Consistent with AI's theme of introducing the Arizona Pest Management Center and the goals of this Summit, I thought it might be important to revisit, review if you will, what it is we are talking about when we say, "Integrated Pest Management". In so doing, I hope to bring everyone to the same level playing field of understanding, as this will become important when we embark on our prioritization process this afternoon.



IPM has deep roots in Arizona and even deeper roots in agriculture. And one thing has become apparent. World-wide, IPM is clearly viewed as not only one way to manage agricultural pest problems, but the best way to protect crops. However, despite this universal assertion and widespread recognition of concept by scientists and practitioners, IPM still suffers with respect to ambiguous definitions and difficulties in implementation. While I cannot address this latter problem in this presentation, I do wish to bring some clarity on the topic of what IPM is, specifically, "What's the 'I' stand for?!"

What's the "I" ^{Not} Stand for?

- Insect



But before we jump into what it does stand for, let's consider what it does NOT stand for! While I am an entomologist, and clearly my first love is insects, I must admit freely and openly that the "I" does not stand for "insect." Weed, pathogen, and vertebrate scientists were historically slower in acceptance of the IPM concept, in part, because of its close affinity to "insect" IPM and its genesis as a concept with some pioneering economic entomologists. But let's be clear. IPM is surely much more than "insect" pest management.

What's the "I" ^{Not} Stand for?

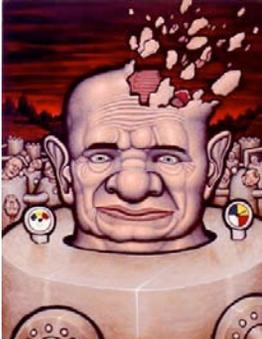
- Insect
- Insecticide



At times in our history, the "I" has been accused of standing for "insecticide." IPM is a robust concept that has endured over 35 years and over many different eras of insect control, including ones where insecticides were over-used or over-dependended on. However, the "I" does not stand for insecticide. In spite of critics who believe IPM has gone too mainstream and is not edgy enough any longer, IPM does in fact make use of insecticides and other pesticides as needed and as appropriate. But this singular tactic is not what IPM or the "I" is about.

What's the "I" ^{Not} Stand for?

- Insect
- Insecticide
- Intelligent
(usually followed by 'Pesticide')
- ...



The corollary to "insecticide" is "intelligent" pesticide management for IPM. Once again, it is true that we hope for and plan for the rational use of pesticides within IPM, but the "I" is not and should not be relegated to this limited idea of what IPM is.

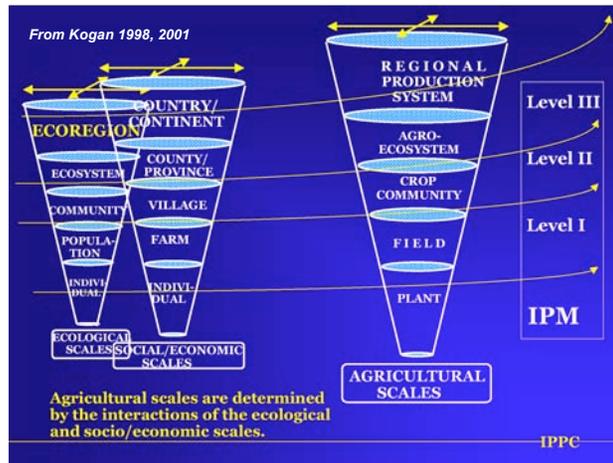
What's the "I" ^{Not} Stand for?

- Insect
- Insecticide
- Intelligent
(usually followed by 'Pesticide')
- ...
- Integrated



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In fact, as we all know, the "I" does stand for "Integrated". Unlike insect, insecticide, or even intelligent, this word is a little less obvious in meaning to the lay public, which is unfortunate. Often times, however, it is explained or represented by a series of interlocking jigsaw puzzle pieces, each representing some tactical area of control. However, this representation does not do the concept full justice.



While visually much more complex, Kogan's review of IPM (1998) provided us a model for understanding organizational complexities across various scales: ecological, social/economic, and agricultural, the latter being nothing more than the interaction of the other two. At its core, we can see that systems smaller in scale or number are simpler, while those that are larger are much more complex. Integration, therefore, can occur at at least 3 organizational levels. IPM has been operating for decades now and most commonly at Level I integration, the field. Some effort is extended to Level II, and only rarely do we aspire to develop Level III IPM, where, in essence, we are architects of the agroecosystem in which IPM occurs.

Levels of Integration in IPM (from Kogan 1998, 2001)

- Level I – "**Species / population level integration**"
 - The integration of control methods for single species
- Level II – "**Community level integration**"
 - The integration of the impacts of multiple pest categories on the crop and the methods for their control
- Level III – "**Ecosystem level integration**"
 - The integration of multiple pest impacts and the methods for their control within the context of the whole cropping system or ecosystem

Kogan (1998) appropriately places the emphasis of IPM on "Integration." At Level I, integration of control methods for a single species is common. In Level II, this integration extends to multiple pest categories and methods for control. However, under Level III integration, we should expect this all to occur within the context of an entire cropping system, or ecosystem. This should be our ultimate goal: to have such an understanding of the distribution and abundance of pest (and beneficial) organisms within a system so as to make ecosystem level, strategic decisions considering a wide array of control tactics.

Integrated Pest Management

- Consideration of:
 - Multiple tactics including informed inaction
 - Multiple pests and pest groups

Level
I
II

- Consideration of multiple crops or sites in ecosystem

III

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So to re-iterate, INTEGRATED Pest Management should, at level I, involve consideration of multiple tactics, including “informed inaction”. At level II, it should operate on multiple pests and pest groups (e.g., weeds, insects, mites, nematodes). But ultimately, to achieve level III integration, we should be considering multiple crops or sites within the ecosystem.

While we’re at it, I guess we should finish off the alphabet...

Integrated Pest Management

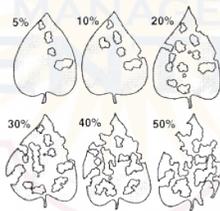
- An organism out of place or time
 - As determined by humans

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The “P” does stand for “pest” and not “pesticide”. Again, IPM makes use of pesticides as needed, but hopefully all of us remember from our school days that a pest is merely an organism out of place or time. It is important for our lay audiences to recognize that this is a human-determined classification, and does not carry any biological status. After all, a pretty flower to me in my front yard is a pest weed in a farmer’s field. Even a very recognizable “good guy” in the lady bird beetle can be an incredible homeowner nuisance when the Asian Lady Beetle makes it way into houses congregating by the thousands. So context is important.

Integrated Pest Management

- Directed action or strategy to maintain or lower pest densities or limit damage
 - Implies tolerance of some level of organisms



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Management is a concept that gets misunderstood sometimes. It does involve directed action or more properly a strategy to maintain or prevent existing pest densities (or damage) from becoming problematic. But at its core and something we need to stress with lay audiences is that “management” implies that there are some levels of organisms (or damage) that we are willing to tolerate. And in fact, those of us in agriculture know that there are really many times when the densities of potential pests are below our level of concern and “no action” is often the control tactic of choice.

Federal IPM Roadmap (2004)

- Goal
 - Increase nationwide communication
 - Identify strategic directions for IPM research, implementation, and measurement for all pests, in all settings



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These days, it would seem, everyone has a “roadmap”. Perhaps it is even a little cliché at this point. But in fact, our federal partners have developed an IPM roadmap. Their stated goal is to increase communication nationally and to help identify strategic directions for IPM in the future.

While this sounds a bit bureaucratic and maybe too abstract, there are some rather important things that have occurred in this roadmap.

Federal IPM Roadmap

- Planning for **change**
 - Resistance to pesticides or cultural practices
 - Restrictions or losses of certain pesticides
 - Pressures from marketplace
 - Environmental concerns
 - Consumer demands
 - Public opinion



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And after all, if we don't even consider change, we cannot plan for it. And change is inevitable. Whether it comes in the form of a new resistance to key pesticides or some foundation cultural practice; or due to losses of key pest management tools; or just general changes and pressures from the marketplace; we need to be prepared.

IPM, Federal Definition

"Integrated Pest Management, or IPM, is a long-standing, science-based, decision-making process that identifies and **reduces risks from pests and pest management related strategies."**

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I hate to do this to you, after telling you how one of our problems is "ambiguous definitions." But in this case, the new federal definition of IPM is quite important and quite telling. It certainly is not the longest or most detailed definition. Yet, it is quite comprehensive and quite expansive, relative to past definitions. In fact, the change is significant enough to constitute a new paradigm...

O.k...

Paradigm Shift!

- From pesticide reduction
- To risk reduction



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O.k. I know when you hear “paradigm shift”, many of you are likely wanting to get up from your seat and run screaming from the auditorium. But... this time the feds got it right! This shift is important, because it takes emphasis away from “pesticide reduction” and places it squarely on “risk reduction”. Why is this important? Because pesticides are not the chemical tools of old. They are not the broadly toxic, broad spectrum post-World War tools that carried with them a number of non-target and off-target effects. Pesticides have, in fact, changed in significant ways, not all of which I have time to explore here. But suffice it to say that where we were once spraying lbs and gallons per acre of these materials, and often times repeatedly, we now used grams and ounces very sparingly throughout most of agriculture.

Risk Reduction

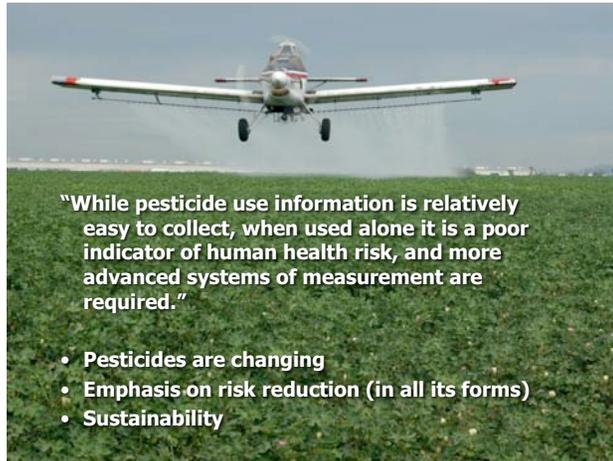
- Least possible risk to:
 - People
 - Property
 - Resources
 - Environment
- From pests & pest management practices



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Risk reduction can come in many forms and is a universally understood concept. The federal definition of IPM identifies it as a risk reduction strategy that will limit risks to people, property, resources (economic and otherwise), and the environment, from the pests as well as the full complement of pest management practices that might be deployed against that pest.

This is a useful and pliable concept that can be used very well across all the environments in which IPM is deployed. And it is a timely change...



Because, "While pesticide use information...". Bottom line, pesticide reduction is not a proxy for progress any longer, esp. in most agricultural venues. It might be a goal in specific cases: in limiting a particularly hazardous pesticide or limiting exposure in specific contexts (e.g., in the home). However, pesticides are changing. Some have no neuro- or mammalian toxicity whatsoever. They are strategic tools used against only very specific growth stages or population densities. They are insect growth regulators, soaps, salts, feeding inhibitors, pheromones, behavior modifiers. Emphasis is therefore appropriately focused on "risk". And embedded in these concepts is the idea of developing sustainability. Systems that are durable, less consumptive, and more productive.

Impact on Us?

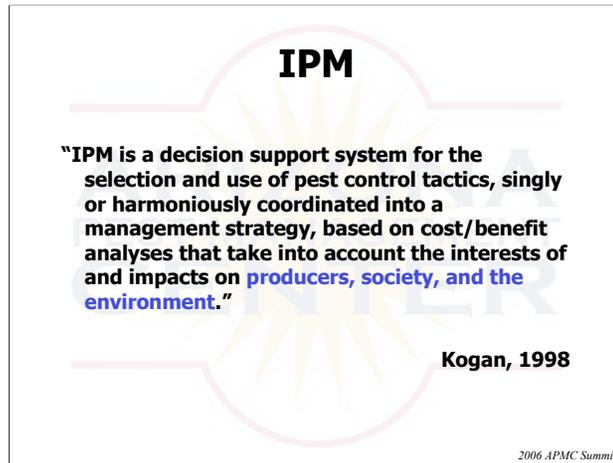
- "...**federally funded IPM program activity performance must be evaluated.**"



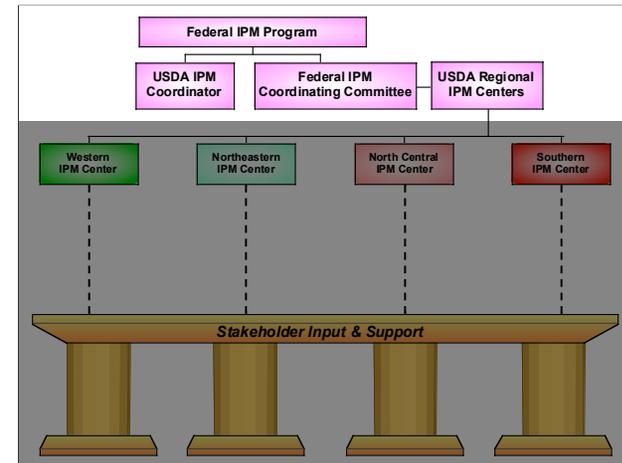
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O.k. So what's the big deal? What's the impact here at home of this new road map and definition?

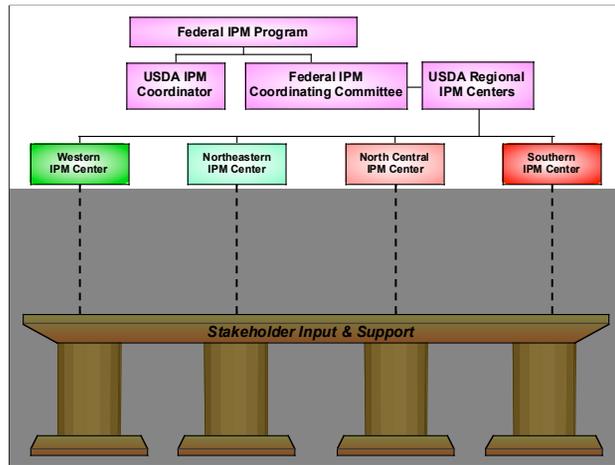
Within this roadmap, the feds are telling us that we need to be accountable if we seek and use federal funding. Our performance must be evaluated. It is not enough to say, "we did our IPM; please give us more money." We now need to measure and show how our programs have impacted our end-users, and do so in meaningful, scientific ways.



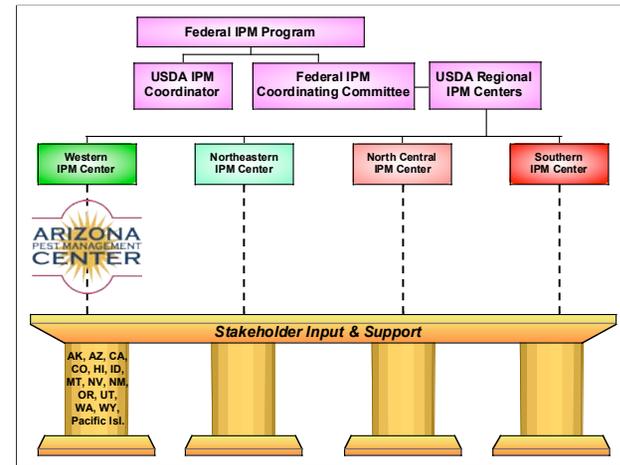
So enough of the federal viewpoint. Let’s turn to just one more definition that I like because it mentions whose interests we seek to protect and impact, that of producers, society, and the environment. If we manage these three things in our design and delivery of IPM, then we are on the mark, no matter how you ultimately define IPM.



And what presentation on the concepts would be complete without another try at an org chart. I don’t want to dwell on it, except to say that the organization of the APMC is no accident. It closely parallels the organization at the federal level. The federal IPM program is guided by a Coordinating Committee and a single IPM Coordinator, Dr. Mike Fitzner, both of which are informed by these regional IPM centers that you will hear more about.



These four regional centers represent the IPM interests of their member states and territories.



In our specific case, the Western IPM Center is, in part, informed by Arizona's interests through the Arizona Pest Management Center. This is what connects you to the federal system and gets your needs and priorities to those agencies who are seeking to fund IPM in the regions.

All Things to All People

- **Farmers:** reduce costs & protect health.
- **"Environmentalists":** replace pesticides in ag.
- **Registrants:** permit continued use of pesticides while reducing risks to people & environment.
- **Regulators:** as precise prescriptions to replace schedules.
- **Scientists:** integrate new knowledge, increase predictability of pest incidence & reduce risks to environment.
- **Politicians:** welcome the concept of IPM because almost no one opposes it.

Uhm, 1999

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I'd like to close by paraphrasing Uhm (1999), who noted, like many others before him, that IPM really is "all things to all people". In my view, it is very main-stream, perhaps to its own detriment. The concept is robust and has stood the test of time, but it doesn't have the flash and edginess of something brand new. Nonetheless, farmers reduce costs and protect the health of their farm-workers with IPM. Environmentalists, which we all are by definition, think IPM is replacing pesticides in ag. Registrants see IPM as helping to continue the use of pesticides while reducing risks to people and the environment. Regulators view IPM as precise prescriptions that replace schedules of the past. Scientists see IPM as an ecological framework ready for integration of new knowledge that increases pest predictability & reduces risks. But lastly, politicians welcome the concept because almost no one opposes it.



The Arizona Pest Management Center (APMC) as part of its function maintains a website, the Arizona Crop Information Site (ACIS), which houses all crop production and protection information for our low desert crops, including a PDF version of this presentation for those interested in reviewing its content.

Photo credit: J. Silvertooth