Is IPM dead, or just sleeping?

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In the Beginning

I started my farming career in 1984 at the end of my sophomore year at Virginia Tech. I went to work for a large orchard in central Virginia where my first job was inspecting peach harvest crews all summer long. I also did some summer pruning, a little fruit packing, and a few other odds and ends – but basically lumbered my way through 58 straight days of hot, humid conditions during a massive, 600 acre peach harvest before heading back to college. I never looked back and have been in fruit production ever since.

That said, although I was on a horticulture track and had taken some introductory pomology courses, I was still pretty ignorant about tree fruit pests and diseases. However, there was something about farming that attracted me. My fascination with the work of pest management, and IPM, would come later. Maybe it was because I loved the outdoors and had a soft spot for environmental conservation, but I desired to understand and learn more about fruit production, pest management, pesticides, and the effect they had on the environment and our food.

In 1985, I got my first introduction to spraying – riding on the broken seat of an old Massey Ferguson tractor, spraying peach and nectarine trees with a noxious combination of parathion and Thiodan all summer long. I also spent a lot of time digging at the bases of trees looking for peach tree borer infestations and signs of stem pitting disease. But it wasn't until about mid-summer 1985 that I got a whiff of what IPM was really all about and the potential that it held. That year I spent a good amount of time with Virginia Tech entomologist Doug Pfeiffer hanging Oriental Fruit Moth mating disruption ties on 600 acres of peach and nectarine orchard.

After I graduated in 1986, I spent the next 3 years working and learning more about tree fruit production and Integrated Pest Management than I'd ever learned in my time at school. By 1989, though, it was time to move on. I left Virginia for Ithaca to pursue a Master's Degree in Pomology at Cornell. Though my thesis was on fruit thinning (6-BA to be precise), my real passion was IPM. By that time the Alar crisis had up-ended the apple industry, and pesticides and food safety issues related to pesticides were real issues. My interests in IPM and pesticides began to grow.

In 1992, I left Ithaca for Minnesota where I worked for eight seasons. Minnesota had a totally different growing climate, with different varieties, pest and insect pressures, and therefore a unique environment for exploring what IPM was really all about. During that time, I expanded my knowledge and use of IPM tools like pheromone trapping, degree days and biofix models, scouting, spray schedules, material choices, etc. There were a lot of changes, new tools, ideas and approaches – as well as consumer awareness – that pushed the use of IPM to new heights, and provided a lot of opportunities to move things forward. Even dabbling with the idea of growing fruit organically was not too far-fetched.

By the turn of the century, I found myself back in New York. I collaborated with Red Tomato Marketing in the development of their first-ever Eco-Apple protocol – a protocol that required the use of many of the available IPM tools. NEWA came online, then more recently RIMpro, and the use of weather stations and predicative models became more advanced (and accurate); even the spray materials were

considerably less toxic and more pest-specific.

Despite all of the advances and tools, and the obvious need for greater implementation, IPM has failed to become standard, comprehensive practice with growers – right now, it's just a buzzword with little in the way of being fully integrated into industry growing practices.

So where are today?
Unfortunately, fear is the primary mechanism of how decisions are made in the tree fruit industry. And with good reason. In large part, any pest damage results in down-graded fruit and cosmetic damage is the unfortunate quality standard of how we measure success. A little scab, codling moth injury, plum curculio, apple maggot – by themselves or together – are unacceptable. Anything that reduces yields or packout is unacceptable. It's a whole lot easier to put on that additional scab spray, even if the models say the threat of infection is low, than to risk an infection you may have to fight all season long. Even if that spray turns out to be unnecessary – the cost savings versus the potential for lost revenue doesn't make sense in today's produce world. Who wants to save $200 when the risk is a $10,000 loss? So when it's simply easier to just go out and spray every 5-7 days versus checking traps and monitoring models – and with less risk – is there even a place for IPM in today's growing environment?

What is IPM?
"IPM is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties." Nowhere in this definition does is talk about spraying or pesticides. Yet, that is where we usually start when we discuss pest management. What do I need to spray, how much, and when? It's unfortunate, but that's reality.

What is IPM? Let's start with what it is <u>not</u>:

IPM is not:

- Calendar spraying
- Spraying whatever your neighbor's spraying
- Spraying whatever your chemical rep says (without justification)
- Spraying based primarily on whatever is being shipped from a warehouse
- Putting away your sprayer early to save a few dollars and then complaining about the codling moth damage later
- Spraying because, well, it worked last year.

IPM is:

- Appropriately justified and applied pesticide applications based on…..
- **Weather stations**. Great for just knowing what the heck is going on, but you also need one to use NEWA or RIMpro. One station per unique site is optimal.
- **Pheromone traps**. These give critical information on population dynamics of numerous pests (needed for BioFix markers, population trends, etc.) and timing of pesticide applications.
- **Pest modeling**. NEWA, RIMpro, and Washington State's Decision Aid System (DAS) help predict the need for, and timing of, pesticide applications.
- **Biological control.** Beneficial insects, mites, and microorganisms. These are the predators and

parasites that help control many insects and diseases. These are front line defenses and help support appropriate pesticide applications.

- **Mating disruption.** Similar to pheromone disruption, but actually stymies mating, which reduces subsequent populations of pests such as codling moth, OFM, and dogwood borer. It can reduce the need for expensive sprays.
- **Resistant varieties.** If trees aren't susceptible to a pest problem, they don't need spraying for it.
- **Management of surrounding habitat.** Removing plants that harbor damaging insects can be helpful in reducing pressure. Likewise, selecting or even planting specific plants and trees can increase populations of predator and parasite populations, birds, and bats that combat damaging insect populations.
- **Sanitation.** This includes keeping the orchard clean of old infested bins, dead or dying trees, noxious weeds, and other potential sources of pest infestations.
- **Management of plant stress.** In these days of changing climate, we never know what the weather will be, how insect or diseases will react, and therefore we don't know how susceptible trees are to pest attack. Managing simple things like water relations more precisely, understanding tree fruit nutrition, physiology (e.g., pruning and thinning), reducing use of herbicides, and even site or varietal selections can all reduce pest susceptibility by increasing plant health.
- **Soil health.** Soil health is one of the best ways that growers can positively affect everything from plant health and nutrition to crop productivity and fruit quality, yet it continues to be given short shrift in ways that baffle me. We're still focused on nutrition being about NPK, irrigation is still not necessarily a 'given' for new orchards, and there is little if any real consideration of what's going on underground with fungal communities and overall microbiological activity. These are the communication networks, the internet if you will, of the orchard. They are the orchard's life support system.

Conventional Farming is Failing.

Late last year, I made a comment to small group of growers – none of whom who are in this room – that conventional farming was failing. And while I still believe that is true, the reality is that conventional farming simply can't keep up with all the changes that we are facing on a year in and year out basis. And it can't keep up because conventional methods are simultaneously damaging orchards and undercutting the support systems of our farms by creating orchards dependent on a heavy dose of synthetic inputs. Climate change, weather variability, invasive insects, disease pressures, export market demands, consumer demands, and regulatory demands are all impacting the industry's ability to achieve the high level goals it needs to remain viable. It is hard enough to keep up with all the changes, but we can't afford to think that we can continue to just spray our way out of each situation. The need for comprehensive adoption of integrated pest management has never been greater than right now.

In the past few years, we've seen brown marmorated stinkbug, spotted wing drosophila, black stem borer, and now spotted lanternfly enter the scene. Even 'old' pests like woolly apple aphid, apple mealy bug, and codling moth are re-emerging as major issues. This can be partially blamed on the loss of broad-spectrum insecticides, but reality is that their ability to survive better from year to year – with little competition – is increasing.

In order to combat these problems with more than sprays, we need to take a proactive approach to building healthy orchard ecosystems. The answers lie not just with discrete IPM practices, but with a broader philosophical approach of regenerative orcharding.

Regenerative farming is not a new concept *per se*, but it is new to our industry. To regenerate means to rebuild. And to rebuild, we need to start with the soil and work our way up. By starting with the soil, we can create the foundation for healthy trees and orchards. And by creating healthy orchards we have the capacity to create ecosystems, rich, diverse multi-species orchards that support a broad array of life that builds on itself allowing for more diverse interactions and increasing plant health. Regenerative farming is cyclical, not linear. Of course, healthier trees grow more and better fruit, but they also last longer, there is less decline, and theoretically fewer inputs over the long term – in large part because you're able to better leverage the full power of IPM techniques.

Where do we go from here?

First and foremost, we need to shift our thinking from a purely spraying mentality to an ecosystem-based philosophy. We need to stop thinking in terms of an A+B=C approach and thinking of orchard practices as complex algorithms. In the early 90s, there were a number of researchers who worked on various expert systems to help growers make more effective pest management decisions using IPM. The IPM Institute of North America continues to evolve the Eco-Apple protocol with an even broader approach that considers all farm operations as well as discrete farming practices. The IPM Institute has even developed PRiME (Pest Risk Management Engine) as a way to evaluate the overall risks of a spray or sprays to the environment. Cornell's apple pollinator researchers have recently developed a program for choosing pesticides based on risks to pollinator species[1]. In addition to the tools listed above, we – the industry – have all the tools we need to move from a strictly spray-based approach for pest management to a broader holistic approach that considers all levels of the orchard business.

Sudden Apple Decline is the perfect example of a bad situation that we can't spray our way out of. Greater attention to pre-planting conditions, plant health, precision nutrition and irrigation, and soil health, however, are the keys to reducing the potential impacts of SAD by increasing the resiliency of your orchards through development of diverse ecosystems. The use of the full range of IPM techniques allows this to happen. Ultimately, the result should be healthier orchards, greater productivity, better fruit, and reduced inputs.

We're at a point where we need to be making better, broader, and more proactive pest management and orchard health decisions than ever before. IPM takes into consideration the entire orchard and surrounding environment, not just productivity and cosmetic issues. Growers are pumping millions of dollars a year into new orchards and yet are often leaving out some of the best, most cost-effective tools available to help with crop management and long-term productivity. Now, most of my interactions with growers quickly get boiled down to spray decisions – and I get that is part of the process – but we have more IPM technology and tools available to us than ever before to be able to make better decisions before spray recommendations are made. Yet, from my perspective, IPM techniques are being used less than ever before. The evidence supporting the benefits of a regenerative, holistic approach to orchard management is growing, and it is critical to long-term success. It would be a shame to miss this opportunity, because today, right now, we are at a crucial turning point in orchard management practices whether we like it or not.

[1] https://pollinator.cals.cornell.edu/sites/pollinator.cals.cornell.edu/files/shared/Pesticide%20Decision-Making%20Guide%20to%20Protect%20Pollinators%20in%20Tree%20Fruit%20Orchards.pdf