Advancing Integrated Pest Management Adoption and Achieving Extension Impact: A Working Group Success Story

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SUMMARY. Extension and research professionals in the southeastern United States formed the Southern Nursery Integrated Pest Management working group (SNIPM) to foster collaboration and leverage resources, thereby enhancing extension programming, increasing opportunity, and expanding the delivery of specialized expertise to nursery crop growers across a region. Building a productive and lasting working group requires attracting a group of research and extension faculty with complementary expertise, listening to stakeholders, and translating stakeholder needs into grant priorities to help solve problems, all hallmarks of effective teamwork principles. SNIPM has now grown to include 10 U.S. states and 11 institutions and has been awarded seven grants totaling \$190,994 since 2009. A striking benefit of working group membership was observed over time: synergy. Greater awareness of individual expertise among SNIPM members, each of whom were focused on different aspects of the nursery production system stimulated multistate extension publications, electronic books (eBooks), mobile device applications (apps), popular press articles, and spin-off research projects when separate foci were combined and directed toward complex challenges. Deliverables achieved from this faculty collaboration include nine peer-reviewed publications, four manuals and books and 23 book chapters, and a combined total of 11 abstracts, conference proceedings and extension publications. To date, the return on investment for SNIPM is one deliverable produced to every \$2265.89 in grant funding. SNIPM has also been honored with multiple American Society for Horticultural Science publication awards as well as the Southern Region Integrated Pest Management Center Bright Idea Award for the quality and originality of their project outputs. Continuing to work together toward common goals that bridge technology and serve the nursery industry while supporting each individual member's program will be crucial to the long-term success of this working group.

Part I. Developing a successful, sustainable working group

From 2008 to 2011, Cooperative Extension Service programming in several states was subject to devastating reductions (Floyd, 2014; Serenari et al., 2013; Wang, 2014; Warner et al., 2014). The result of these budget reductions was fewer extension specialist full-time equivalents (FTEs) for a given crop group. With both insufficient budgets and FTEs, a working group model can be a viable method to effectively and efficiently sustain programming in the 21st century while simultaneously capitalizing on the regional nature of

its membership. In 2008, these economic conditions coupled with the sudden and unexpected change in the 2008 Farm Bill that changed integrated pest management (IPM) grant funding from formula to competitive, led to the development of SNIPM (Agweek, 2008; Civic Impulse, 2008). This new regional group would have the capacity to collectively compete for funding. In addition, individual member's

expertise could complement one another, allowing the group to serve their respective stakeholders better than could single individuals. Lastly, members in warmer locations could inform members in more northern locations of pest development to avert imminent pest problems, and likewise, members could inform one another of regionally distinct, emerging trends. The objective of this manuscript is to describe how to create a vibrant working group that fosters synergy to optimize benefits for members, stakeholders, and granting agencies using SNIPM as a case study. Supplemental information about SNIPM (i.e., leadership positions, mission statement, etc.) is available online (SNIPM, 2017).

MEMBERSHIP. Creating and maintaining an active working group has many challenges. Following effective teamwork principles when building membership can greatly enhance the working group's productivity (Himmelfarb Health Sciences Library, 2017). Having a critical mass of members and appropriate distribution across subject matter expertise is important because projects that often require contributions from several subject matter areas can become difficult to advance without adequate membership to initiate and sustain them. Because SNIPM is IPM-focused, having disease, insect and weed management, as well as horticultural expertise represented was critical. Even with intentional membership building, a deficit of plant pathologist members has limited some projects and affected the time to complete some projects.

Membership must be carefully and strategically assessed beyond subject matter expertise. Strong work ethic and the capacity to take on a greater workload are essential potential member attributes. Despite synergistic benefits, a working group will increase faculty work load. Consider not just a potential member's current accomplishments but their ability and desire to take on more. Our working group found success in seeking members who were not

Units			
To convert U.S. to SI, multiply by	U.S. unit	SI unit	To convert SI to U.S., multiply by
0.4047	acre(s)	ha	2.4711

always the first name associated with a given area but instead someone who consistently demonstrated productivity, assistant professors who were eager for opportunities to demonstrate leadership as well as opportunities for achievement, or both. Recently hired faculty members often do not have as many current projects and professional commitments as established faculty members and are actively

cultivating stakeholder relationships and opportunities to fulfill stakeholder needs. Area extension staff provided indispensable networking with nursery producers. Such connections assisted in cultivating a dedicated advisory board and helped ensure our programmatic efforts remained aligned with real-world issues while helping to validate our assumptions about growers' challenges, capabilities, and limitations. For example, when the app, *IPMPro*, was being developed by SNIPM and a few affiliated faculty (Fulcher et al., 2013a, 2013b), county-based staff as well as advisory board members helped ensure that the select few images that were included clearly illustrated each pest, abiotic problem, and cultural practice.

Given the competitive climate of grant-driven academia, establishing working group member buy-in is essential. Without buy-in, it can be difficult to find potential members who are committed to fully engage in sustained efforts outside of their immediate program. Rotating leadership and grant writing opportunities in a democratic way within the group helped SNIPM achieve and maintain buy-in, a critical component of effective teamwork (Heathfield, 2016).

Ensuring that appropriate credit is given was another aspect of creating and maintaining buy-in that was essential for the longevity of the working group. SNIPM is a large, multidisciplinary team. Our accomplishments have been possible because many extension and research professionals contributed substantively to scholarly output, such as eBooks, a comprehensive pest management manual, and workshops. Regardless of how cumbersome the process, proper credit must be given to each contributor. Assigning authorship when many authors are involved can be difficult, but was necessary. It was also essential to educate administrators that several coauthors was not automatically a red flag; it signified extraordinary collaboration and selflessness as each person gave up having their own unique accomplishment for which they would receive sole credit to contribute to a common output.

A complicated aspect of membership was how to address members who were not contributing. This can

be compounded by a working group whose membership or leadership is mostly composed of assistant professors because they may not be able to affect needed membership changes. Instituting effective teamwork principles by designating a procedure for resolving issues and establishing contribution policies from the inception of the group can make the correct action more evident and less subjective or personal during these challenging situations (Heathfield, 2016).

STAKEHOLDER NEEDS ASSESSMENT AND PRIORITIZATION. The inception of SNIPM was unique in that working group funding was secured from the onset through the Southern Region IPM Center. The role that this funding has had in catalyzing SNIPM's success establishing a working group model cannot be overstated. Because of this early funding, SNIPM established an advisory board that rotates membership among leaders in the nursery production industry (one to two per state) representing ≈7500 operations in member states (U.S. Department of Agriculture, 2014). The working group meets with the advisory board about every other year. The funding also supported a comprehensive needs assessment including online surveys, live surveys, and facilitated discussions. These stakeholder-identified research, extension, and regulatory priorities formed the foundation of SNIPM's programmatic efforts and have been published as a comprehensive Pest Management Strategic Plan (Adkins et al., 2012; Braman et al., 2015; Fulcher et al., 2012; LeBude et al., 2012) for the benefit of nursery producers, state and federal regulatory and funding agencies, university administrators, and other research and extension faculty, as well as SNIPM membership.

This comprehensive stakeholder needs assessment articulated pest issues in critical need of research, identified inexact or nonexistent management techniques in need of refinement or development, and articulated necessary educational materials or platforms for delivery that were not currently being met, all of which helped SNIPM prioritize initial efforts. Successfully sustaining and updating SNIPM's efforts has been possible through continued use of an advisory board to update

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the needs assessment and serve as a sounding board for new ideas and grant proposals. SNIPM's advisory board served in crucial functions, such as selecting a name for our app and identifying a need to curate a website with the only best information for each given topic in one location. They also brought water rights issues to the forefront of our priorities, despite of not being directly related to IPM. Collective programming rooted in stakeholder-identified issues created extension impact beyond our experiences as individual extension professionals.

Part II. Creating extension impact, return on investment, and maximizing faculty benefits from a working group

Beneficiaries

Stakeholders, funding agencies, and members benefited from the working group model that was adopted by SNIPM. Nursery producers benefitted by access to high-quality, regionally produced extension documents and educational resources, such as extension publications, a series of eBooks, popular press articles, and apps. Because of the closer association of extension professionals within the region, nursery producers now have a more direct line of communication with specialists to address specific, acute problems.

Content of educational materials was guided by advisory board feedback, and thus the materials were tailored to current grower needs and emerging issues within the region. Growers downloaded 2262 and 481 electronic copies of our tree book and shrub book (volume I), respectively. In the southeastern United States, 150 print editions of the tree book and 3000 paper copies of the shrub book (volume I) were distributed. The greater length and greater per page cost to print the tree book limited the number of print copies. Growers indicated use of the information in the shrub book saved them an average of \$44.15/acre and \$28.37/acre for container and field growers, respectively (Chappell et al., 2017).

In 2014, a listening session with SNIPM advisory board members was used to refine the curriculum for a 2-d IPM workshop for nursery producers. Participants were surveyed 3 years

after the workshop. They adopted more sanitation practices, set aside more time to conduct intentional scouting sessions for diseases, arthropods, and weeds, and adopted the use of a standardized sampling plan as a result of the workshop (LeBude et al., 2017). The majority of growers reporting an impact of the workshop (75%) experienced a 7.9% increase in profit as a result of implementing IPM practices taught at the workshop. However, response rates to economic impact questions were low and further assessment is needed to more completely understand the long-term economic impact of this and other discontinuous IPM trainings to our stakeholders.

Funding agencies, specifically the Southern Region IPM Center, have benefitted from SNIPM. SNIPM leveraged their dollars and reached more stakeholders across a broader geographic area than individuals or smaller teams could have (Fulcher et al., 2011; White et al., 2013). For example, SNIPM's first two eBooks, available in pdf and eBook formats, IPM for Select Deciduous Trees in Southeastern U.S. Nursery Production and IPM for Deciduous Shrubs in Nursery Production Vol. I currently have reached people in 71 and 32 countries, respectively (Adkins et al., 2012; Braman et al., 2014).

FACULTY BENEFITS. Faculty benefitted from being members of SNIPM in part through cooperating, as opposed to competing, for the same grant opportunities and because synergy that ensued from collaborative projects increased their overall productivity (Fulcher et al., 2011; White et al., 2013). Four of the six SNIPM members who were assistant professors during its inception were surveyed informally for refereed publications, book chapters, and extension publications, in 2010 and again in 2012, 1 and 3 years after SNIPM formed, respectively. Of this group, 50% had zero total refereed publications (either individual program-based or SNIPM collaborations) in 2010. On average, members had 1.3 and 4.8 total refereed publications (individual program-based and SNIPM collaborations) in 2010 and 2012, respectively. In 2010, no book chapters were published individually or as SNIPM collaborations, but in 2012, surveyed SNIPM members

collaboratively published on average four book chapters, whereas no individually authored book chapters were published. This is a small sample size and the increase from 2010 to 2012 could reflect the natural progression of a new faculty member's program and publication record. It is possible that working group-affiliated publications could have replaced publications from the individual's program, such that there was no net increase in number of publications or synergy occurring. Because the standard for earning tenure and promotion is demonstrating an independent research and/or extension program, generally indicated by first authorship, and because our breakdown of output by SNIPM-affiliated and individual programs indicates otherwise, we did not feel that is generally the case. For example, in 2012, 75% of SNIPM members surveyed had 2.7 SNIPM-affiliated refereed publications for every 1.3 non-SNIPM refereed publication. Therefore, SNIPM-based refereed publications increased while individual program publications remained stable at 1.3; they did not decrease as they would have if SNIPM-affiliated publications were replacing them. To the contrary, it appears that SNIPM has attracted highly productive members and that a working group model has provided a vehicle by which member productivity is augmented or enhanced. The close association and ready ability to collaborate also helped these faculty achieve publishable extension outputs sooner. As early as 2010, members published three SNIPM-affiliated extension publications for every non-SNIPM extension publication.

Since 2009 when SNIPM was formalized, all six faculty members who were assistant professors were promoted to associate professor and received tenure. A subset of this group (three of the six hired at about the same time) was surveyed, and of those surveyed, 83% of book chapters and 100% of mobile apps were working group collaborations, whereas 44%, 37%, and 24% of abstracts, refereed publications, and extension publications, respectively, in promotion and tenure dossiers were SNIPM-affiliated. However, just 8% of conference proceedings were SNIPM collaborations, likely reflecting the extension

focus of our working group funding as opposed to research.

INTANGIBLE BENEFITS. There are other substantial benefits that cannot be measured. Some of the intangible benefits include leadership and networking opportunities for new faculty and the opportunity to develop a strong rapport with professionals working in the same crop area. The following testimonials reflect the impression that being a part of SNIPM has had on members.

“SNIPM activities helped me to develop highly productive professional relationships with key extension specialists in the southeastern U.S., to build my extension program, and to publish (books, book chapters, refereed publications, extension factsheets, and smart phone apps). SNIPM outputs and activities were a solid component of my tenure and promotion packet, helping me achieve tenure and promotion to Associate Professor.” Sarah White

“The impact of SNIPM on my career has been profound. The deliverables associated with this collaborative working group assured that despite having no research appointment, I was able to log a significant number of peer-reviewed manuscripts, abstracts, proceedings articles, etc. that bolstered my CV. Additionally, book chapters, mobile apps, trade publications and extension publications related to this project were greater than 51% of my total pre-tenure productivity. Without this collaborative effort, I am confident that my P&T process would have been more uncertain. Finally, this working group helped greatly in building my national reputation in the commodity of nursery production, which aided significantly during external review of my P&T packet.” Matthew Chappell

“Association with you and members of SNIPM has been a highlight of my career. Thank you.” Win Dunwell

“Joining SNIPM has had an immeasurable impact on my career as a new faculty member. This group has allowed me to serve as a co-author on multiple books, book chapters, refereed journal articles, abstracts, and grant proposals – all of which would not have been possible without the multi-disciplinary

team approach. While these outputs are beneficial, the greatest benefit of SNIPM is the opportunity of working alongside so many great researchers and extension specialists that I have admired for years.” Chris Marble

Working together and aligning our approach with stakeholder needs generated intangible benefits for the nursery industry, as well as SNIPM members. Intangible benefits for growers include avoiding dilution of content across several states and websites that could cause newer or higher quality material to be harder to find and thus less used by producers.

WORKING GROUP SYNERGY. Synergistic effects of the working group increased SNIPM members’ ability to generate deliverables. These synergistic effects had two main causes. First, the old adage “many hands make light work” applies. Writing a 13-chapter, 321-page book became much more manageable with 18 co-authors. The work load could be divided with each person making a substantial contribution without an overwhelming time commitment, except among the editors. Second, the authors strove to provide exceptionally high quality information tailored for each audience. For example, content originally prepared for chapters from each IPM book was updated with greater emphasis on scientific aspects and results from experiments, and rewritten as review articles, which required considerably less time invested than a review article on a previously uninvestigated topic. Finally, information was condensed, and in some cases simplified, for popular press or extension publications, and then rewritten in its most clear and concise form to reach an audience with a range of reading levels.

Although SNIPM members could have met their collective obligation to the granting agency and individually to their respective universities by solely completing a defined objective, they instead chose to invest in the working group by delving deeper into each deliverable. For example, we did not limit our effort to publishing a book, coordinating an educational workshop series, or conducting a stakeholder needs assessment survey. We saw a multiplier effect by examining those projects for greater impact by assessing

stakeholder perceived value of our IPM books and eBooks, medium-term (3-year follow-up) workshop impacts, and analyzing and publishing the results of the needs assessment, as examples (Chappell et al., 2017; Fulcher et al., 2012; LeBude et al., 2012, 2017). Multiple avenues for publishing in addition to the agency’s expectation were always considered. Collective deliverables also generated opportunities to make meaningful contributions through symposia and workshops such as “How A New Working Group Used Synergy to Fuel Economic Impact and Increase Deliverables” at the International IPM Symposium and “Advancing Technology Adoption and Achieving Extension Impact: A Working Group Success Story Workshop” at the American Society for Horticultural Science Annual Conference (Marble and West, 2017). Finally, adapting innovative technology into extension programming, such as developing mobile device apps, also generated synergistic opportunities for presentations and publications (Fulcher et al., 2013a, 2013b).

RETURN ON INVESTMENT. SNIPM has a combined total of 94 published deliverables and programmatic accomplishments since 2009 (Table 1). The majority include book chapters (23%), presentations (20%), and peer-reviewed publications and popular press articles, each at 9%. During the same time period, SNIPM has been awarded \$212,994 in grant dollars and direct university support. The return on investment for SNIPM is \$2266, which does not include economic impacts of our educational workshops (LeBude et al., 2017). Although not an exact comparison, a single state, comprehensive IPM-focused programming for nurseries, that included a weekly scouting service and educational workshops, had a return on investment of \$20.79 for every grant dollar invested, as estimated from grower survey responses (Fulcher, 2012).

Financial support from the initial Southern Region IPM Center grant and the ensuing stakeholder needs assessment served as a catalyst for this nascent working group and, in turn, enhanced productivity. A multiplier effect, or synergy, was possible because of many extension and research professionals engaged and invested in

Table 1. Type and quantity of Southern Nursery Integrated Pest Management working group deliverables and their percentage of overall working group effort.

Deliverable type	Individual deliverables (no.)	Portion of total deliverables (%)
Peer reviewed	9	9.57
Books and manuals	4	4.26
Book chapters	23	24.47
Abstracts	6	6.38
Proceedings	1	1.06
Regional publications	3	3.19
Departmental reports and extension publications	4	4.26
Popular press	9	9.57
Presentations	20	21.28
Mobile device apps	2	2.13
Grant proposal or preproposals SRIPM ^z	7	7.45
Grant proposals (not SRIPM, not funded)	3	3.19
Educational workshops	3	3.19
Total	94	100

^zSouthern Region Integrated Pest Management Center.

a collaboration focused on a common goal, even as they were seeking tenure in a highly competitive environment of grant-based program support. Each member filled a niche and attribution was given appropriately. Close professional relationships, greater awareness of individual expertise, and the need to work together in the face of significant Cooperative Extension Service budget reductions fostered greater collaboration within the region. SNIPM members strategically explored a greater depth of deliverables from funded projects by seeking opportunities to publish information for multiple audiences. Because we built SNIPM together, we all share in its accomplishments and shaping the future for this working group.

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